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J. R. Forberg

Collection and Field Note Book

No. 60

(March 10, 1961 - March 24, 1961)

(41456 -- 41722)

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Kealehaha, Kailua - Hilo, airport jct. 192 to end.

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Field note book # 40
beginning with
41456
ending with # 41722

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Robt. allerton - Lawai-Kai, Koloa
John Wyatt Gregg

Tape recorder. Japanese Victor Corp.

samples of beat sent to
Estella Leopold. Is probably
overlain by lava flows. Two layers
separated by clay layer 3'

March 10 - flight from Honolulu to Kauai. 6:05 p.m.
Only about half of the Ewa Coral Plain have forest still in forest. Refinery is actually on Barbers Point. Some bad erosion, perhaps bulldozer erosion, on first of main ridges coming down bet. Ewa and Nanakuli.

Kauai - flats on east side are all in sugar cane plantations. Mango trees in gulches. near Lihue.

Kato tells me that there is forest in Kilohana crater that has probably not had cattle in it.

Also says there is Pisonia inermis at 3500-4000' on Puu Waawaa, Hawaii. Says there seem to be 4 Pisonias in H.I. (2 leaders, one with lvs. petiolate, other sessile.

Sam Patterson - says most of bauxite areas are under cane & pasture, with solid growth of Leucaena bush; a bit under rain forest and some bauxite under Schinus terebinthifolius berry. Bauxite developed on old flow skips. Knows a place where 2 thick buried peat layers

2 1961 Hawaiian Is.

Mar. 10 - Round Top, Honolulu 280 m.

41456 Sambucus mexicana
3 established on brushy slope
small tree 4 m. tall, a few ~~leaves~~ leaves ~~with lower leaflets~~ slightly bipinnate at base; flowers white.

Mar. 10 Manoa Cliff Trail 420 m.
in degraded koa forest

2 57 Ficus
planted
strangler, sterile.

2 58 Elaeocarpus
planted
tree, sterile.

3 59 Psychotria (Straussia) hadrantha
occasional to common
shrub, fls. white 5-6 parted
infl somewhat drooping

2 60 melast.
sterile shrub.

3 61 Psychotria (Straussia) mariniana
common
shrub. fls. white 4-5 parted
infl. stiff.

~~4~~ 61a Psychotria hexandra
rare
shrub 1.5 m. tall. sterile.

Mar. 11 Head of Kalalau Valley, east of lookout

3 62 Myrsine
edge of degraded Metrosideros forest
?900 m. small tree 5 m. tall, sterile; leaves appearing chlorotic.

4 63 Nertera granadensis var. insularis Hook. f.
common on ~~trunks~~ clay
banks at roadside in cloud forest
Scattered. — very coarse, prostrate, light green, fls. yellow; fruit red.

~~64 Scaevola~~

Mar. 11 - Kalalau Lookout, head of Kalalau Valley ?900 m.

3 64 Scaevola
edge of Metrosideros forest
shrub 3 m. tall, erect; fruit black.

3 65 Coprosma
edge of Metrosideros forest back of cliff
shrub 2.5 m. tall, fruit immature.

3 66 Gouldia
edge of cliff in wet forest
shrub 1.5 m. tall; fls. dark pink outside, green inside.

(ctd. on 61.14)

Mar. 11 Road w. of Lihue
Big ravines with Pandanus + lowland forest.
Lower slopes of first range - open Pandanus forest irregular, patchy.

300 yds n.e. Kaudeem gab. Kaua Rd. Pt.

Just west of here - exposure of gray clay with bauxite under a red weathered flow with bauxite. thru several feet this is. 30' down is a black peaty layer. (sample not sent to Denver). Clays all way down.
Gray clay is buried swamp clay.
Alpinia speciosa lines roads in places. Melastoma abundant. Pineapples.
Low ridges wooded with open woods, with gleichenia. Much planted Casuarina, grevillea Eugenia jambolana, araucaria, koa around Kalaheo sugar cane on lower slopes, pineapple above.
Hanapepe Gulch - walls covered by Leucaena scrub - some kiawe (Eleele + above), opuntia.
Kiawe - opiuma forest patches.
Beyond Hanapepe soil very red.
Low flat canyon mouths open kiawe forest or savanna pasture.
Waimea R.
Thin Leucaena on walls of canyon at Waimea. Kiawe at bottom.

Flats w. of mouth of river old lapon bottom. mostly cane
Kekaha. Bluffs with kiawe - Leucaena - cactus. Also Pluchea odorata along Kokee rd in lower part.
Upper slopes of canyon wall pili grass, some shrubs + cactus.. D'adonaea
Flow slope in cane.
Badly eroded gulches.
Grevillea plantings above cane area are very bad shape - disease? fire?
Pteridium. higher, Styphelia scrub. scattered koa.
Wilkesia.
Koa more abundant upward. Also planted Grevillea, Melaleuca + Casuarina locally.
Some ieie up a bit but basically koa forest.
Koa forest becomes closed upward. Some Lantana locally dense under koa.
Waimea Canyon lookout - 3400'
Little green on rubber canyon walls
plateau except on steeper slopes. Tiny stringy of kukui in ravines
Slopes at top of walls densely wooded. Lowest slopes fairly well wooded.

Photo of Hora forest at Lookout
Acacia decalbata + Grevillea planted
in it, but not in photo.
Erosion around rims.
Tibouchina along road
above Lookout.
Very little Lehua. Ptychelia
abundant along road.
Up a mile or so much
planting - Eucalyptus, Cupressus,
Cherokee rose established.
Fore hooves.
Dodonaea common.
Lehua becomes more abundant
also other native tree
ground PMR establishment.
Dracaena. But still one
mostly Hora. Rubus abundant.
Kokee Park - Lehua forest.

Pit in flat area in Kokee
stream drainage at about
(Camp 7 en Rd.) in a mottled
clay and goethite mixture,
somewhat hardened into black
ironstone. Ground water podzol ??
(sample). Looks much like
profile in Ivory Coast (deep pit).
Lehua forest with ~~mostly~~ many
planted exotics.
Divide ridge Hora.
Kalalau Road - Hora gives way
to Lehua somewhat above
Kokee. Much Rubus.

(99-MF ~~air~~ survey air photos, show
bog areas in alakai swamp.
Much Lehua forest
flattened by Hurricane Dot.
Lehua Macanni has very
thin peat, hard rock.
Patches barren in alakai
swamp, peat up to 6'
Patterson got about 8
peat cores with hand auger.
(On frames K1-58 + K1-33).
Photos show a striking
mosaic of bog + forest. ±
Bogs underlain by a white
clay - largely halloysite ?.
Probably much of
this underlain by material
like that in Kokee pit.
Lehua Macanni much
drier than other bogs. Peat
1-2").

Forest rather open and
degraded in most areas,
thick undergrowth with
Rubus.

Kalalau Lookout - clear day.
ridges and steep slopes
rather badly eroded.
photo Lower slopes with scrub
Lehua in gulches. Valley
bottoms forested. Cliffs

forested at top and ribbed 1/2 to 1/3, lower steeper parts almost bare but grassy. a with thin scrub.

Lowhout surrounded by lehua forest - some Gleichenia. Forest 10 (15') m. tall, gnarled not very mossy. Canopy rather open. Moderate undergrowth, some Rubus. Athyrium abundant. Dobbya also on ground.

Canopy open but trees closely spaced, small average 8-15 cm. some larger to 20-30 cm.

Jeep road east of Lowhout Photos of road and of plateau back. Solid lehua forest.

Head of valley here has cliffs thinly wooded from top to bottom.

End of road is in cloud forest, mainly lehua, on deep peaty layer overlying clay bed (photos begin roll 2) Photos in forest. stature to 10 m. Some Cheirodendron. Astelia (a very small slender one) on tree trunks.

Tibouchina down as far as Puu Ka Pala.

Small gulch that Kohee Rd. crosses has grassy upper slopes, esp. on west more brushy on east, esp with Leucaena, Ichu, cactus. Erythrina common locally. Gulch bottom Miconia - Leucaena forest, much P. cuchea in very bottom.

Road to Wahiawa
sugar cane. Then across a gulch wooded esp. with Eugenia cumini.
More sugar.
Turn left to Thain place. Through gate, then pasture. Second gate. Hill & rt. with koa forest. Planted Casuarina, Grevillea on some slopes. Acacia confusa and Eucalyptus, a Melaleuca with very small leaves. Albizzia. Waiwi.
Along road an almost completely exotic forest.
Forest reservoir.
Much Gleichenia. some lehua! then degraded lehua forest, some koa.

Area east of Wahiawa Bog - trees almost completely dead. Gaichenia and low bushes left with standing dead trunks. Much Lycopodium cernuum Shrubs below entire most of the trees of former forest. Scaevola abundant.

Bog covers about 20 acres. general level of vegetation about 3-4 dm.

o Metrosideros
o Gleichenia lin.
q Lycopodium cernuum
q Rhynchospora
o Lobelia
o Ilex
o Chaindendron
o-c Machaerina ang-
c Euphorbia multiforme
o Santalum
o Peleg
~ Styphelia
x Myrsine sdh
~ Viola
l Carex
ol Oreobolus
~ Eugenia f. hookeriana
x l Panicum sp.
~. Polystichum tamar.
~ Wikstroemia sp
l grass

~ Smilax

Scattered through bog are larger shrubs of Metrosideros, Cheirodendron, Eugenia, Pelea, Lobelia, Myrsine Ilex.

Scattered small pools and irregular winding trenches filled with water

Some spots, especially low muddy ones dominated by Rhynchospora + grass.

Lower:
Gulch down from Kaala
Ko + fronting Hon.
Cultivated veg. Eugenia cumini, Hibiscus til planted Eucalyptus. etc.

W. extension of Hanpu Range south slopes with grass and thin woods + scattered trees, with slopes Gleichenia. + scattered trees
W. of this Hibiscus Ilicaceae + Pandanus. Lower slopes planted Eucalyptus forest.

Libwe to Kafara —
Hills beyond Hamamanda
badly eroded, mostly
covered by thin scrub with
scattered trees, more wooded
on lower slopes. Bluffs and
ledges grassy.. Much
red clay exposed in
great erosion scars.

4 1 4 67		Lysimachia on edge of cliff in wet forest	shrub 1 m. tall, buds and pedicels glutinous, corolla white, flushed distally with pink.
1	68	Broussaisia arguta Gaud. f. arguta on edge of cliff in wet forest	shrub 1 m. tall, flowers and capsules deep maroon purple.
		March 11 – Waiawa Barg, south base of Kahili Peak, east of Hanapepe River in open bog with depressed vegetation	680 m
1	69	Drosera very common on mud	hairs on leaves reddish, pod white (only one seen)
2	70	gram Sacciolepis contracta (W & A.) Hitchc. common locally	spikes blackish.
1	71	Lobelia common	shrub with latex, 1 m. tall, 2 racemes from rosette at top of stem, corolla white with dark purple lines in middle of lobes.
1	72	Viola kauaiensis Gray rare	flower white within, purple lined without.
1	73	Santalum ellipticum Gaud. occasional	shrub 0.6 m. tall, dull reddish green; fruit green.
1	74	Korthalsella occasional, parasitic on Metrosideros	cylindrical, branching decussately.
2	75	Rhynchospora laxarum Gaud. abundant	
1	76	Mapania rare	shrub 1 m. tall leaves chiefly chlorotic, fruit black.
1	77	Polypodium tamariscinum Kaulf. rare, on base of shrubs	
1	78	Styphelia douglasii var. struthioides common	shrub 0.4 m. tall; flowers white, 5-merous.

4 1147 3a Pelea waialealae Wawae
occasional
2 74a Ilex anomala H.&A.
occasional

shrub 1 m. tall.
buds greenish white
shrub 1 m. tall, flowers white.

Mar. 12 - west slope Nonou Range, above Opaekaa Stream. 2?50

3 75 Ba Rhododendron racemosum
in secondary forest on steep slope

old tree 12 m. tall, 4 dm dbh. with thick branches, dish maroon, glossy on immature fruit; buds unopened.

Mar. 12 - ridge east of Hanalei Valley ?3,000

3 76a Wikstroemia
in boggy sparse low forest on white clay

shrub 1 m tall, sterile.

4 77a Coulidia terminalis v. makoensis
in boggy sparse low forest on white clay

shrub 1 m. tall, decussately divaricately branched. flowers dull purple outside, green within; fruit blue.

3 78a Ageratum houstonianum
abundant on roadside

erect, aromatic, flowers bright lavender purple.

1961 Hawaiian Is.

Mar. 12 NE. face Waialeale (~photos) - thin forest on steep slopes & cliffs. Original fields green, prob. Gleichenia on sides of ridges at base. Cliff has narrow vertical valleys.

Flat land backs of Nono - mostly pasture thickets of Eugenia cumini, Hib. til, Mango; planted Eucalyptus acacia koa in hedges.

U. of H. Agr. Exp. Sta. Bauxite Reclamation Project. front of Makaleha Mts.

Kolon flow slopes, cut by deep ravines. Has evidently been pastured and abandoned (or not abandoned :), now covered by grass (Melinis ?) with patches of Gleichenia, scattered trees - Eugenia, Psidium cattleyanum, scattered Pandanus. (3 photos roll 2)

Kalaheo.

Check plot - no treatment

Past ob.
Glenwood grass
Setaria glauca
Myrsine
Stachytarpheta
Richardia

Perf. Conv.
Sporobolus
Cuphea
Emilia sav.
Elephantopus mollis.
Digitaria chinensis
Thin on topsoil - removed and replaced.

On untreated subsoil it was a year before any plants appeared.

first pub. Bauxite Red. Proj. mimeographed report.
M. Takahashi Norman, thesis.

Nonou Mts. - (Sleeping Giant)
back side densely wooded down to pastures at base. Mixed grass + Mimosa.
Forest at base of strawberry guava, some Eugenia cumini.
Ground cover of Oplismenus with occ. Polypod. scol. + Cheilanthes tenuifolia.
Upper end occ. Alsmitera & Pandanus
Abundant str. guava seedlings, no native plant seedlings.
Upward into ravine Eugenia malaccensis becomes dominant - ~~as slope~~ ends

Puhili - on side slopes
mac Pandanus, Psidium
guajava. This became
abundant locally.
Up the gulch the Psidium
Litsea become abundant
again but not much
a closed vegetation.
Trees here to 2½-3 dm. dbh
+ 15 m. tall. Much
Nephrolepis, Thelypteris,
Microlepia + Polypodium
with the Aplasmonea.

Road up Waikoa Ridge.
Ravines filled with
hau and java plum. Flow
slopes pineapple + cane.
Steeper slopes guava brush,
scattered Eugenia, mango,
planted Casuarina, some
Cercaea Formosa. Planted
Eucalyptus.

Road around Kapaa to Kealia
Flow overlying old soil - charred
roots in soil at contact.
Pineapple fields - gulches
between filled with Eugenia
cumini.
Hills on left - ridges
and steepest slopes grassy.
Slope loosely to densely
wooded. More so around

toward Lumahai.
Wood in lower valleys
mostly java plum, some
hau Psidium litt. Lamarck
headgrut. Mango guava.
Molokai Beach.
Pasture on slopes. Wood
in ravines. Grevillea
sp. planted abundantly
(red fls.)
Then came on flats or
flow slopes.
Tuff cone some distance
to rt. said to have broken
thru a coral reef.
Kilauea.
Kalihiwai V. bluffs are
wooded with hau, kiaka,
Eugenia cumini. Thick,
with mile, casuarina
etc. in flow some grass.
Casuarina on bluffs to n.w.
Some pasture with guava
+ brush, some pineapple.
Steep into inland densely
wooded except for areas of
Gleichenia on slopes.
Flow slopes in pasture
lower ones pineapple or pasture.
Rows of Eucalyptus or
Eugenia cumini along roads.
Guava and hau in thickets.
some pandanus.

1961 Hawaiian Is.

Hanalei V. Flat bottom has nice field, garden pastures. (Rice is also nice).
Lower ~~middle~~ slopes ~~gleicheniaceous~~ with scattered trees. Upper wooded
Extensive ~~bog~~ forest on valley bottom & on lower & slope.

Pastures on east have been seeded to Pangola. P. dil.
East slopes steep, partly gleicheniaceous, partly thickets of guava, strawberry guava Callycine, Pandanus, and, above forest reserve boundary, some lehua.
Ageratum houstonianum abundant along east ridge.
Well up on sloping flats there is lehua forest in which the trees are mostly dead or dying. Thick low brush and gleicheniaceous.
An area of white clay 15-20' deep on which is an open low lehua 3-5 m. tall with much Gleicheniaceae. Thin peat or muck layer 3-6", P.H 3.8 acc. Patterson. Looks like a bog but with sl. larger trees.
These areas, a few acres or 10's of acres in extent scattered on the flat slopes but ~~not~~ ravines.

Well above this on red soil is further broken down lehua forest. ~~Abundant~~ very tall slender Pritchardia scattered through area. Large trees dead. small epiphytic lehua on most of trunks, sending down roots like a strangling fig. Clusters of small astelia on them. Also Claphoglossum.
(quite a few photos).
Road runs along ridge through cloud forest, predominantly lehua but very rich. Few dead trees.
At end of road view ahead of some isolated flat plateau-like areas. Here are many dead trees.
Bananas in deep gulches even here. Few palms on steep slopes.
Rather Deeply weathered red-brown to red soil, a few feet.
Very irregular canopy. Some staghorn.

Photos across Hanalei V. and on ridge east, thru of secondary wood + gleicheniaceae.

1961 Hawaiian Is Kauai

Bluffs west of Hanalei covered by Pandanus forest and in more exposed places by Scaevola. (photos) Valley less exposed by koa + guava. Casuarina.

Lower slopes beyond Hanalei grassy with scattered rounded trees.

Beach forest of Casuarina Norfolk Is. pine, Araucaria Kaena - Hau tangles with Casuarina, guava on flats.

Cliffs with Bidens conspicuously in bloom. Sida, grass, small shrubs, pockets of wood in cirque-like valleys.

Pandanus on lower slope. Kukui also.

Pandanus also up to high ridges.

This corresponds to pili grass on drier slopes and ledges

Mar. 13 - flight Lihue to Honolulu at end of point directly in line with runway the sand back of the beach shows excellent wind striation.

Mar. 14 Honolulu - Maui flight. about 2/3 of the bloom of Diamond Head Crater and part of lower slopes are densely wooded. Outside slopes only very slightly vegetated, mostly towards base

Photos of Koko Head area.

Molokai on right - Apparently a marsh back of second long beach from west end, surrounded by Kiawe forest on flat.

Upland east of this open, with considerable red erosion scar. Narrow sand strip largely revegetated by kiawe & brit. also slopes of ravines SE of it.

Otherwise considerable grass with red scars and scattered small trees or bushes or no woody vegetation at all.

Pineable fields on most of upland flat ground.

Generally the thickest woody vegetation is on steeper slopes, but not consistent.

Slopes up to East Molokai grassy, cut by wooded ravines. Interfluves wooded

1961 Hawaiian Is. Molokai

upward. Cliffs more and more wooded eastward.
Kalaupapa pen. all grassy except talus at foot of cliffs, which is wooded.
East Molokai mostly cloud-covered. Lower part of cliffs and mouths of valleys visible, sparsely and irregularly wooded, otherwise grassy.
Some very flat spots above cliffs, e.g. Waiahuu Halawa, probably open bogs.
Ridges n. of ~~Waiahuu~~ Halawa rather dry and denuded, some erosion. Flow slopes s. of ~~Waiahuu~~ Halawa very green, gulches dry and sparsely wooded. Small isolated grassy.

West Main - Flow slopes cultivated, gulches wooded, but lower parts only sparsely so on west side. Upper parts of flow slopes grassy up very high on n.w. side
Gulches on north side very deep wooded except near mouths. Flow slopes bright green, ~~grass~~ pasture. Cliffs ~~thin~~ thinly vegetated
An ~~Iliha~~ Kahenui ridge

cane goes up & breaks in slope. Trees come down to line.
Areas back to N of Kahului are rather bare somewhat eroded hills, valleys and ravines in them wooded.
Much Kiawe forest back of Kahului on Isthmus, east of Isthmus cane. some rows of trees along roads. trees around villages.
(33 min. Hon - Kahului.)

Maui - Waiehu to Iao Valley by taxi.
Planted Casuarina on lower slopes - Mixed wood of Persea, Aleurites, Eugenia cumini, Samanea, Melia, Mangifera, etc. in valley bottom. Grass.
Casuarina scrub
In canyon steeper slopes are grassy, less steep have open to closed scrub. Lantana, Aleurites in little hanging valleys and in side gulch bottoms. Uppermost slopes, ridges, cliffs wooded, but rather sparsely.
Up in valley guava scrub on lower slopes above the Kahului which here fills

the valley bottom
Cliffs here thin vegetation.
Cordyline et [illegible],
above guava level.
End of road at view of needle. Have point above road end. By Patch of native forest on steep slope on south side above Kukui.
many planted ornamentals
Several other smaller bits on slopes at foot of cliffs but mostly Kukui.
Little but thin grass on cliffs.
Around lookout and trail immediately above it mostly guava scrub. Some small Metrosideros on side toward Needle
Cordyline Capitatum
Lady Apostles Telfairia pentaphylla
Weeds on trail, Sphenomeris & Nephrolepis exaltata abundant, a little Psilotum nudum. Sadleria and Microlepia over edge toward Needle

Stupendous erosion, cliffs, peaks, waterfalls to Needle, a basalt spire. Bed of stream with great boulders.
Some Iyanvels serious but prooerly planted.

Mar. 14 - Waiehu - Kahului
patches of kiawe, building, pond with Sesbania marsh.
Weed patches.

Mar. 14 - Kahului - Olinda - Waikamoi 8:30 - 12:30

Plantations on level ground of Isthmus and up lower slopes of Haleakala. road lined with Grevillea, Savanea, Eugenia, etc. at first. Not on slopes.
Ravines filled with Lantana, Guava, Lonicera, cactus.
Acacia
Pukalani. Jct. Rt. 37 - Rt. 40.
Pineapple fields. some pasture.
Eucalyptus, Persea, Grevillea
Makawao. turn on Rt 39.
Above Makawao pasture with patches of Eucalyptus forest. with guava undergrowth some mixture of Acacia dealbata.
Road lined by E. globulus
Olinda Prison Camp.
Gorse begins
Eucalyptus first. Then Stretch of pasture, rocks with Sadleria and

1961 Hawaiian Is.

few other native plants.
Then the road enters a forest, at first mostly planted, Cupressus macrocarpa and Eucalyptus, then changing at once to native montane rain forest - lehua forest with strong admixture of koa and Cheirodendron.
Thrips

Drive for about ½ mile through excellent forest of this character to intersection with road to Waikamoi pump.

4:00 Stop here and proceed on foot down road toward pump.

Dense trees at entrance are lehua, Cheirodendron - several small trees immediately on left. Small Alsobia beneath trees on both sides. Very fine-leafed large shrub immediately to right of entrance Stypholoma sp. Serrate leafed shrub at ent. is Broussaisia. Opposite it, on left, Coprosma

70 paces in, on right, the largest tree with narrow leaves + its bark acacia koa

To the left of the road the forest has been cleared along the pole line. Rubus sp.

I. arundinaceum, also Gleichenia glaucescens, pseudochina, Lycopodium cernuum, Gleich. linearis, some regrowth of lehua, etc.
Of the two large ferns along the road, the bipinnate one is Sadleria souleyetiana, the tripinnate one Cibotium

Along roadside a form of Prunella vulgaris,
Poa ? sp. Holcus
Cyperus

On mossy banks and tree bases Peperomia pseudoreflexa var. insularis, is abundant - creeping, with vermillion fleshy fruits.
Athyrium cf. pinetorum common.
Cross pole-line clearing and descend into low forest of koa, lehua, Cheirodendron
Gleichenia here approaches G. lin. var. tomentosa.
Careful examination of Cheirodendron may yield Korthalsella platyphylla, a leafless loranthaceous parasite.
Just at first sharp turn in road Clermontia sp. may be seen straight ahead - oblong

leafed shrub in crotch of
on banks. Vaccinium calycinum
is small shrub on roadside
here. Good examples of
Cibotium cf. glaucum on
Diamondhead just below
this turn.

Around the next turn,
a few feet off trail to right,
a half fallen tree with
Astelia sp.

Undergrowth along road
has much Eupatorium
adenophorum, Gleichenia,
Lycopodium cernuum
some Lycopodium, Vaccinium
Dicranopteris linearis along road
On old tree fern trunk on
right Grammitis pseudo-
grammitis and Hymenophyllum
obtusum?

Myrsine sp. a slender
shrub on right just below
this.

Lehua dominant here.

Off the trail the under-
growth contains a profusion
of ferns, incl several Thelypteris
(T. cyatheroides sl. aff. etc.), Ralfsia,
Chrysium sp. Cibotium,
a very large Carex.

On fallen log: Hymenophyllum
recurvum. Sperguina sp.
Nertera, Astelia, Polypodium
sp. Trichomanes bimarginatum.

P. taxifolium
Astelia
Polypodium

Shrubs include Ilex sp.
Broussaisia, Coprosma sp.
Myrsine (Rapanea) sp.
Hymenophyllum on tree trunks
Climbers - Alyxia, Smilax,
Stenogyne sp. Vaccinium cal.,
Gaultheria terminalis var crebata
(Thymbles), Rubus macraei
(whineberry), Cyrtandra
cf. cordifolia, Clermontia sp.
Cyanea sp. (large fls. spinulose)

Good place to go in forest
to left 50' before first bridge.
2 blotos in opening with two with Astelia
Beyond bridge 30 m. on
left, Gaultheria hillebrandii.
At turn, Freycinetia on
left. Good understory
of tree ferns in open lehua
forest. Gleich. lin.

Abundance of young
Cheirodendron trigynum
due to opening of road.

Beyond bridge Clermontia
fairly common, Rubus and
Coprosma (as well as P. tenetrans + R. macraei)
Piptrums at first turn on left.

Beyond second turn large lehua
tree over road with excellent
display of epiphytic Astelia,

Polypod. sp. saffordii
Cladh. hirtum, Polypod pell
Asplenium sp. (King, at base)
4 Photos in this forest.

1½ mi in — On road out - 3 curve with large koa on either side. Koa dominant here
Acacia koa
Cheirodendron
Metrosideros collina
Sadleria souleyetiana
Cibotium chamissoi
Myrsine cf. lessertiana
Gouldia terminalis v. undata,
Broussaisia arguta v. hellwigia
Coprosma ~~sp~~
Clermontia
Vacc. calycinum
Rubus penetrans
R. sandwicensis
Cyrtandra 2 sp.
Cyanea sp.

Epiphytes
Elaphoglossum hirtum
~~Gaphoglossum~~
Polypodium thunbergianum
P. pellucidum
Cheirodendron seedlings
Broussaisia seedlings
Elaphoglossum
Clermontia shrub
Peperomia hawaiensis lobata

on rt. up hill

Hymenophyllum recurvum
Ashleia

Ferns
Athyrium cf. sorientiana
A. sandwicensis
Trichomanes bauerianum

Pamakani
Tetraplasandra sp.
Gouldia hillebrandii

Makawao - Ulupalakua R.
Rt. 40 12:50 -
E. of Makawao - pastures with scattered planted Eucalyptus, Cupressus, Grevillea, etc.
Pulehaleni jct. Pineapple left on rt. 37. Through pineapple fields.
Turn on Lower Kula Rd.
Pine fields. Gulches with Ohia, Lantana.
Weedy roadsides with Chloris gayana, Trichloris.
Riparian pastures.
Planted Grevillea, Acacia in gulches.
Shrub Ohia in pastures. Abutilon. Lantana.
~~Kahoolawe~~ can be seen on rt.
~~Haleakala~~ Ohia Forest

1901 Hawaiian Is.

Gulch south Acacia de.
Pteridium in patches.

Waialua.
Schinus. acacia

Hwy 37 again.
Much acacia dealbata.
Scattered farms.
Vegetable gardens.
Lava flows with pasture
Lantana - heavily parasitized.
Heohea - Kula savatonum
Rough pasture & lava.
mist lantana & cactus.
Vast expanses treeless.
Motokini island in
strait this side of Lanai.
Malia trees.
Cinder cone below on pt.
Grevillea. Nicotiana glauca
Malia. Argemone.
Eucalyptus planting
around Waialua Ranch.
Prospect Hill - early
Eucalypt. plantings.
Kaluakoe
Punaluabee

4000' s Osmanthus
o Lophira
o Charpentiera obovata
sc Dracaena
r Pelea trag.
r Tetraplasandra
s Myrsine
s Clermontia
c Myoporum
r Ochrosia
sc Alyxia olivaeformis (Maile en lei)
a Dodonaea
sa Osteomeles
sa Euphorbia celastr.
s Coprosma
r Alphitonia
r Metrosideros
c sa Styphelia
sc Santalum haleakalae
o Pittosporum
o Rothrockianum
r Fontania
r Claoxylon

Weeds
Bidens pilosa
Solanum sodomaeum
Erechtites elongatus
Richardia
Hypochaeris radicata
Stellaria media
Passiflora sp.
Conyza bonariensis
Euphorbia peplus
Plantago lanc.

Chenopodium murale
C. botrys
Commelina diffusa
Rumex giganteus
Oxalis corniculata
Agrostis
Physalis peruviana
Conyza
Verbena officinalis
Heterotheca grandiflora
Cyperus
Geranium carolinianum
Pennisetum clandestinum
Carex
Tripolium Eupatorium aden.
ovens Solanum nigrum
Lythrum
Cirsium
Kyllinga brevif. & Osmanthus

Ferns
Polypodium pellucidum
P. thunbergii
Pteridium
Psilotum nudum
Pteris
Asplenium

March 14 - Kula Pipeline west of Waikamoi stream, Haiku Uka
In montane rain forest dominated by Metrosideros

41479 Grammitis tenella Kaulf.
1 epiphytic on tree trunks
2 80 Clermontia
occasional

Photos of Osmanthus
Santalum, Euphorbia,
Dodonaea

Fault fades out into
scrub of Dodonaea,
Styphelia, then into
Styphelia & Asteromeles.

Ruddy tuff stones, 4-5.
Lava flow above Ulupalakua
has mostly Leucas
Pallasia tenuifolia & Psilotum

Just beyond Ulupalakua
beyond Eucalyptus on rt. 37
a clearing grove idea
lava with Kalanchoe.
Bocconia frutescens naturalized.
Hunnemania mexicana
on slope of cinder cone.

Henry Oncing - state forestry.

12:50 PM
4000-4200'

shrub 1.5 m. tall, lactiferous,

4	1481	Carex in small opening		
1	82	Pipturus albidus (H. 2A.)	Opay	branching at base nearly erect. shrub 1.5 m. tall, leaf veins reddish beneath.
		rare		
1	83	Asplenium rare, epiphytic on base of tree,		
2	84	Rubus penetrans Bailey very common in openings		canes low arching, flowers 3 cm across, white, fruit black when ripe.
2	85	Cheirodendron trigynum Hbd.	Heller 1961	small tree 4 m. tall, aromatic, fruit purplish brown.
		very common, especially in clearing along pipeline		erect
2	86	Holcus lanatus L. common along roadside		frond bent downward
1	87	Hymenophyllum recurvum epiphytic on tree trunk	Heller	
1	88	Hymenophyllum recurvum epiphytic on living tree trunk		
1	89	Hymenophyllum obtusum epiphytic on tree trunk		
1	90	grammitis tenella Kaulf. epiphytic on tree trunk		
1	91	Pelea sp. olowaluensis St. John occasional		shrub 1 m. tall flowers green
1	92	Pelea ~~clusiifolia~~ haleakalae Stone ? ad. off occasional		shrub 1 m. tall; buds green.
1	93	Polypodium grammitis rare, epiphytic		
1	94	Carex locally abundant in muddy	place	erect; leaves glaucous beneath.
2	95	Coprosma stephanocarpa Hbd. common in undergrowth		shrub 3 m. tall.
1	96	Rubus ~~macraei~~ hawaiiensis	Opay	shrub 2 m. tall; flowers
		common in undergrowth		rose purple.

~~Dec~~ 1961 Hawaiian Is.

March 14 - Auwahi, s.e. Puu Onli, s. slope of Haleakala in dry open sclerophyllous forest on aa lava flow

3800-4000'
1200 M

41497 Usnea
2 abundant on dead branches of trees

1 98 Pipturus
rare

1 99 Carex wahuensis Mey.
rare

41500a Styphelia
1 abundant — shrub 1.5 m. tall, fruits cunning

1 01a Dodonaea
abundant — shrub 1.5 m. tall, fruit light green, smooth inflated turning tawny on drying.

1 02a Dodonaea
abundant — shrub 1.5 m tall; fruit very dark purple, glossy, rather inflated.

1 03a Polypodium thunbergianum (Kaulf.) C. Chr.
rare in crevices in lava

2 04a Claoxylon
rare — small tree.

1 05a Asplenium adiantum-nigrum L.
rare in rock crevices

2 06a Dryopteris undulata (Hook & Arn.) C. Chr.
rare on ledges Det. D. Palmer 8/59

~~07 common on open ridge~~

2 07a Cyperus laxiflorus Boeckl.
common on open ridge — scattered solitary culms

1 08a Styphelia
occasional — shrub 0.7 m tall, fruit cunning.

1 09a Cheirodendron trigynum (Gaud.) H. & A.
occasional — tree 6 m. tall, fruits dark brown.

2 10a 4/1941 Hawaiian? (gray) Kirby. Sabicea sandwicensis
Blepharocalyx rare
41511 11a Nothocestrum latifolium gray
occasional
2 12a Pisonia sandwicensis umbellifera (Frnch) Sam.
rare Pisonia sandwicensis Endlich. Waipio Valley
2 13a Coprosma stephanocarpa Hbd.
rare
3 14a Alphitonia ponderosa Hbd.
rare
3 15a Santalum haleakalae
locally common

2 16a Euphorbia celastroides
locally abundant
1 17a Pteris cretica L. det. D. Fosberg 4/46
very local in grass
~~17 Same~~
same

2 18a Asplenium adiantum-nigrum
rare

March 14 - ~~Kula~~ Headwaters of Kailua stream, ~~west~~ east of Waikamoi gulch, Haiku Ulka, n.w. slopes Haleakala in montane rain forest dominated by Acacia koa
1 19a Coprosma stephanocarpa Hbd.
common
1 20a Sabicea diffusa Forg.
rare, alt. 4200' in Acacia koa
~~21 Coprosma~~

45

Maui
tree 4 m. tall, ripe fruit yellow.
tree 5 m. Tall

same tree as # 42033

tree 5 m. tall

tree 4 m. tall, young leaves coppery beneath.

small tree 4 m. tall (others much larger), flowers bright red, scarcely any odor, ripe fruit black. flat topped tree, ~~4~~ 4 m. tall, cactiform.

4200'
1281 M.

shrub 2 m tall.

loose climber, sterile.

March 14 - Kula Pipeline west of Waikamoi Stream
Hāhulukū, n.-w. slope Haleakala 4000' 1220 M

4152	1a	Coprosma ochracea Oliv. var. ochracea occasional		shrub 2 m. tall; flowers green.
2	22a	Nertera granadensis var. insularis abundant on mossy banks, logs and tree trunks.	Skottsb.	creeping; light green; fruits vermilion
1	23a	Trichomanes common on ground a		

March 15 - Waikamoi Stream at Hana Road 1700 M

1	24a	Tibouchina Melastomaceae (Schrank & Mart.) bank of small rivulet in bottom of gulch	Cogn. in Sch.	slender erect shrub 2 m. tall; sterile.

March 15 - west slopes of Haleakala along highway to summit. 1830
in open scrub on weathered lava.

3	25a	Lepachinia hastata (Gray) Epling very local, colony of 5 clumps.		to 0.7 m. tall; erect, many stems from base, reddish; leaves deep rose purple; plant strongly aromatic when broken.

Hawaiian Isls.

1	26a	Lycopodium campestre var. occasional under Styphelia	bushes.	
1	27a	Styphelia abundant		shrub 1 m. tall, flowers white.
1	28a	Styphelia abundant		shrub 1 m. tall, fruit pinkish white.
1	29a	Asplenium trichomanes rare in crevices in rocks		
1	30a	Asplenium adiantum-nigrum occasional in crevices in rocks		

Std. p. 50

1961 Hawaiian Is

Mar. 15 - Wailuku to Top of Haleakala. 7:50 -

Thru cane fields to Pukalani jct. (see p 29). Trichloaena conspicuous along roadside. Chloris gayana and Panicum maximum also.

Many small farms and gardens just below and about Pukalani and makawao. Pineapple fields over most of country but Pukalani and somewhat above Lower Kula Rd. Then only on rt. Pasture with patches of Eucalyptus on left. From 2000' all pasture with patches of Eucalyptus scattered Casuarina and Grevillea. Rows of Eucalyptus and large blocks. a few Cupressus macrocarpa on left at 2400'.

Row of Jacaranda on rt at about 2600 Grevillea planted below road. More Eucalyptus. Then open pasture. Opuntia in gulches and scattered in pastures. More Jacaranda along road at 3000' then Eucalyptus and Acacia dealbata. Small farms. Blocks of Acacia dealbata, dominating

landscape to Haleakala turnoff. Scattered clumps on rt the road. Many ~~cos~~ homes and notable flower gardens, many escapes. Patches of acacia, some Cupressus. ~~Pin~~ and other conifers. Myrica faya occasional. Scattered Erythrina at about 3800'. Acacia and Eucalyptus patches and small farms. Planting of Diospyros kaki at about 4000'.

Belt of Eucalyptus at 4200'. Magnificent view of Lahaina and West Maui from just below this (stop?).

Above this belt open rather rough pasture. Pteridium rather common. But generally the pasture is in good shape. Eucalyptus plantation on rt on left at 4700-4900.

Eucalyptus in ravines on rt. Sparse scrub, mostly Erythrina from about 5300': much grazed. Mostly Pteridium. Becomes dense and mixed at about 6000'.

1961 Hawaiian Is.
(ctd. from #461)

4153 1a (grass) Holcus lanatus —.
2 common

March 15 - rim of Haleakala crater at Kalahaku Overlook — 2680 m.

1 32a (grass) Deschampsia nubigena H&A. [illegible]
common in loose volcanic debris — dense tufts.

March 17 - Kapoho House Lots — 2 m.

1 33a Pipturus argenteus var. [illegible]
common in undergrowth in Panicum forest — shrub 3 m. tall leaves glaucous green beneath with red veins.

March 17 - coast south of where Kii flow of 1955 reached sea in scrub forest of Metrosideros on aa lava. — 4 m.

1 34a Diospyros ferrea var. sandwicensis
occasional — shrub 3 m. tall

2 35a Canthium odoratum (Forst.) Seem.
common — shrub 1.5 m. tall, leaves glossy.

March 17 - Kalapana Beach on dunes of bleach sand — 1 m.

1 36a Digitaria henryi Rendle
very local, holding sand — prostrate, forming thin mat.

1 37a Digitaria pilgeriana (Retz.) Kod.
common locally holding sand,

1 38a Panicum Repens L.
common on sand flat around beach bond. — forming dense sod.

panicles purplish.

6200'

Stop at small bridge at
Large bush of Rubus
sandwicensis (?) just below bridge.
Trisetum common here.
Large rosette of Polystichum
~~bolo~~ paleaceum below bridge
on walls of ravine.
Several intr. grasses here
incl. Anthoxanthum odoratum.
also Oenothera stricta, Epilobium
Rumex acetosella. Eupatorium
adenophorum.

In scrub Coprosma montana,
C. ernoderides, Sophora
chrysophylla (bush on
E. wall of gully below bridge)
~~Pouteria~~ Dubautia strathcolida,
Vaccinium ~~sp~~. reticulatum,
are all common
Several bushes of Santalum
haleakalense in ravine
75 m. above bridge.
Geranium cuneatum var.
tridens on left somewhat
above that.
Asplenium sp. and
Polypodium pellucidum
in crevices in wall of
ravine. Carex sp. and
Dianella, also. Asplenum trichomanes
Pteridium abundant

A few scattered compact
Metrosideros coll. ~~several vars.~~.
Dodonaea, also, esp. above and
below rest small bridge.
Styphelia and Vaccinium
dominant on relatively
gentle slopes.
Sophora, Metrosideros,
Dubautia, Dodonaea, Coprosma
Photos of West Maui and
of scrub.

Planted Eucalyptus at
cattle guard.
Pine plantings below
road over considerable area.

Entrance to Park.
Eucalyptus and pine planting
about Park ~~HQ~~ residence.
Above here Sophora becomes
a very important component
1000' of scrub. Geranium
becomes common.
Park HQ.
Proportions of species gradually
change upward. Vaccinium
and Geranium and Coprosma
montana become more important.
Santalum very rare.
Dubautia becomes common
3000' upward, 2 spp.
Scrub becomes more open
upward.
Pleber.

considerable bare lava.
Small clump of planted eucalyptus and conifers below road.
Sophora fair sized in very open scrub on stunt ravine.
Shrubs more and more sparse, also more dispersed at perhaps 7900'. Almost grassland
flower. Sophora, Styphelia most abundant with some Vaccinium + Dubautia on lava beds.
Side road to left, to Kalahaku Overlook.
Small patch of Argyroxiphium in enclosure.
Low bushes here almost all Styphelia tenuifolia.
Grasses Trisetum and

Hypochaeris radicata is yellow dandelion like flower.
Tetramolopium humile just outside Overlook enclosure to left. Lagula camp. v. hawaiiensis dec
Below is enormous caldera a lava desert with a dozen or so big cinder cones and a black lava flow in it running down to left to Kaeroke Gap.
Vast relief. very disrupted here.

On up. desert of broken lava, with scattered dispersed Styphelia, some Dubautia - taller shrubs. Road along crater rim.
Observatory 9805'
Cliffs below trail scattered Dubautia shrubs.

Trail to white Hill 380 ft. Is a boulder desert with scattered Dubautia bushes tufts of Trisetum and rosettes of Hypochaeris between rock. Light gray slabby rock very dense.
A little Tetramolopium in crevices
Cabbage butterfly here.
Road to Red Hill - almost complete desert. several Dubautia bushes only.
Red Hill and Magnetic Hill piles of red clinker.
Hawaii can be seen in distance. & c. Lanai. Molok & Oahu.

Highest Argyroxiphium seen about 7500'. Camp well developed mostly closed or almost so below here.
Dodonaea doesn't go far above

park Hq. Geranium
abundant 150m above Hq.
Dilano shutthoriden
along rd. at about 8900.

Lepechinia hastata above
road in open Styphelio.
Vaccinium sent.
Oreplenium, Polyp. pell.
Pteridium common
Sagula, Carex wahuensis
(at culvert no. 378A 718
small branch rd. just below
6000') On top of lava road cut.
about 5 clumps.
Beyond a bridge and pole line
about 100-150 m.

Trientalis on bank of
Eucalyptus at middle elts.
Bright orang. Just above last
houses. Also on Acacia.

Myrica faya rather common
among small trees.

Pityrogramma on road cut
in pasture above pineapple fields.
Back at Pukalani at 17:20.

12:25
Mar. 15. Makawao toward Hana -
many ornamentals in village
then small pineapple fields.
Then pastures and small
farms - thickets of Acacia.
Koloniaeo.
Eucalyptus, some Cupressus.
Pastures. Guava forest and
some kukui in gulches.
Kaupakalua.
Pastures with clumps of
trees mostly Eucalyptus.
Guava + kukui in gulches.

Dirt road. Large Eucalyptus
forest on right in distance.
Deep gulch with Gleichenia,
Guava forest, grass sward.
Pineapple on right.
Gulches with guava,
Eucalyptus, mango. Pasture
and guava thickets, ~~road~~
Eucalyptus clumps
Peahi.
Acacia, Melaleuca and guava
along rd. Kukui - guava -
Pandanus forest in gulches
and hills to rt.
Jct. Rt. 36 from Rt.
Kahapi gulch - mixed
lowland forest - guava,
many kukui, Pandanus,
strawberry guava.
Hills with low guava

scrub and pasture.
Road cuts with a few
Stylochiton, lehua, koa
sprouts.
Paved hwy. Pastures
some scattered brush -
guava, pandanus, mango

Hbenemeris, Lycopodium
cernuum on road cuts.
Gulches with guava,
gleichenia, etc. Eucalyptus
forest above. Pastures on hills.
Gulches with koa, guava,
kukui
Breadfruit, rose apple.

Hueln.
Waipi sheared rose apple.
much mango, some koa, much
guava. Eugenia cumini.
gleichenia, Pandanus. kukui
Gulches and hills with
small pastures and patches
of scrub. Ferns - Nephrolepis
Hbenemeris abundant on cuts.
Ox. koa and eugenia
malaccensis up gulches.
Kaelua - house, small
farms.
Much koa forest.
Eucalyptus groves. Casuarina.
Bamboo in gulches.
Mixed koa land forest

in gulches and on slopes.
with many planted trees.
Metalenca, Eucalyptus.
much koa.
Sapindus
Hpathoge ttis in cuts
with ferns
Huge bamboo clumps at
Kaaiea gulch.
some koa, mountain
apple.
Eucalyptus and melaleuca.
gleichenia on bluffs.
Waikamoi Gulch. Water 2%.
Bamboo forest on E. side. on W side
a mixture of guava, kukui,
pandanus, koa, with koa
and Eucalyptus above on ridge
Many introduced ornamental
near bridge -
Xanthosoma, Rudbeckia
Impatiens, melastoma. Cosmos.
Lemna, adiantum cuneatum,
Thelypteris spp. Nephrolepis
hirsutula, pamabranch. Crassula
~~or d~~ Dryopteris on drippy cliffs
under bamboo. Antheroeae.
Breadfruit on left just
before turn out of Waikamoi.
Guava scrub on hills
invading pastures.
Ridges with gleichenia
and planted forest of Koa
Melaleuca, Eucalyptus, Acacia
Confusa

gulches with Kukui, Pandanus, Acacia confusa, Eugenia mal. pomo. Rhathodea (n.)

Kaumahina Park - staff trees labelled; view. Pandanus on bluffs, Ironwood. Honomanu gulch Mixed forest incl. Rhathodea Much Koa forest on lower slope. Kukui in gulches. mountain apple, guava, mango, Pandanus, Cocos. Datura arborea. On e. side - Koa forest below, Pandanus above. much Gleichenia also.

Same general mixture for several valleys. Pandanus, Koa, Kukui abundant. Alternate on bare cliffs somewhat before Keanae.

Forest at Keanae largely an exotic mixture.

Keanae Pen. view. Taro patches. Mouth of Koolau gap. in st. Breadfruit trees just after Keanae, before Koolau Gap. View up gap.

Taro patches below on sea side. View. Waikamoi Forkout. Falls. Waiokamoi Falls. Some native plants in Thickets and on cliffs. Koa.

Koa abundant for a little distance. Dennantia + Cibotium on cliffs.

Koa well into West Wailuaiki. also beyond it into East Wailuaiki. Sadleria. Dr Clermontia scattered below. Plants of Melastoma much Koa. almost into Kopiliula. Nice waterfall.

Road up a fine top with mixed koa and exotic forest. then koa with Kukui + guavas

Puakea Park.

Waikamoi Gulch - above water fountain a clump of Touchardia latifolia.

Polypodium scolopendria common on cliffs.

From Jct. 36 + 40. along 36 to Kahului -

Rolling pasture land with some pineapples. gulches with guava, Kukui + some koa. Koa pastures invaded by guava, + Schinus terb. Plan Alumalu - Haiku

Paauwela – mostly pineapple plantations, wooded & brushy gulches. Wind break of Casuarina on left, sheltering mango orchard.

Lowlands along sea – some kiawe, Leucaena, Eugenia cumini, – in gulch with new bridge. More pineapples, then cane plantations to Kahului. Kiawe in gulches.

Mar. 19 – Air trip Kahului – Hana. narrow strip of kiawe back of beach at head of bay, not on north side.

Northwest slope is mostly pasture, wooded gulches. Lower slope pineapples.

North slope is generally wooded – native forest except a belt on west side

Pastures extend around much farther on lower slopes than above

Locally much invaded by guava (?).

Pasture ranches out just before first large bay and gulch. 2 gulches before Keanae Peninsula. Taro in bottom of lower

part of largest valley.

Beyond here it seems to be wooded to sea, except for patches of gleichenia on a few flat ridge tops and a few clearings and small areas of pasture above sea cliffs, some areas up on slopes may have been cleared.

Hana area has extensive pastures above and west of airport, also some E & east of this above and east of Hana. Forest adjacent airport area from sea. Lower gentle slopes around coast from Hana are in pasture

1961 Hawaiian Trip

March 17 - KMC to Observatory
Low open lehua forest
or scrub with scattered
tree - scrub of Styphelia
and Vaccinium. Some Sadleria
and Dodonaea.
Turn toward Observatory
both scrub and trees
more sparse. Mostly Styphelia
but some Dodonaea. Gradually
more sparse to Observatory.

KMC & Volcano House
Sparse forest.
Steaming cracks.

Volcano House to Olaa -
Lehua forest with Gleichenia
some Sadleria. Very soon
changing to taller lehua
with well developed understory
of Cibotium.
Park Boundary.
Concentration of Cibotium
along road for short distance.
Rare Cryptomeria.
Tibouchina very abundant
More Cryptomeria.
Pure lehua with rare
cibotium - Sadleria, Gleichenia.
much Tibouchina locally
along road.
On it a large cleared
area with andropogon and

other grasses, some slight
invasion or sprouting of
lehua.
Lehua forest on left
with a little planting of
exotics.
Then a considerable
stretch of medium lehua
with Cibotium, Gleichenia
and Sadleria. Tibouchina
abundant along roadside.
(M.P. 23)
From here on much
planting of exotics.
Eucalyptus, Melaleuca,
Casuarina, an Areca
palm.
Forest more and more
irregular.
M.P. 21-20-19
Rare bordered by Cibotium.
Forest irregular, much
Eucalyptus, Melaleuca -
still some lehua, especially
young trees. Locally lehua
still dominant.
Hedychium abundant
bet. M.P. 19 & 18. At M.P. 18
much strawberry guava.
From here much less
lehua, not many tree ferns.
Patches of strawberry guava.
~~Natives~~ Eucalyptus.
Melaleuca bet. M.P. 17. Then

4972663

on left cleared land.
Mountain View.
From here down - sugar cane plantation, home gardens. just beyond Mt. View Samburcus mexicana on left. Cane plantations (mt. 19-14-B5
Then heavily cleared land with strawberry guava.
At M.P. 13 grove of palms
Then more cane plantation.
lehua first in distance to right.
More strawberry guava bush. Then M.P. 12 more cane plantation, scattered dwellings. Well before M.P. 11 to it and after - more numerous dwellings along road, cane away from road. Cane to M.P. 10.
Village.. more cane.
above plantation teh. - breadfruit on rt.
Olaa - ~~Kapoa~~ Pahoa.
Cane fields. Large banana and mangos just out of Olaa. and 0.3 mi. out a large Chinese Banyan in yard on rt. some palms.
Guava scrub with gleichenia and then gleichenia with scattered lehua.
Thick for some distance.
a mile or so, then with mango along road
Cane land with andropogon

under Olaa & Olaa & land to breadfruit on left

41 77 N.0

+ 91.5

Cane plantation, grove of Casuarina. Open land with andropogon, some small lehua. Then more thickening
91.3 with sparse lehua on rt. andropogon and lehua on left. - this for some distance, with lehua becoming large and more dense
9 4.3 then Gleichenia with tall lehua, then lehua becoming more plentiful.
9 7.7 and andropogon, some Gleichenia sparse to less sparse lehua.
97.1 large grassy field on rt. sparse lehua ~~on rt~~ across field. andropogon sparse lehua on left, then on rt also. Orchis very common in these fields which started with patches of Gleichenia.
95.7 for 2.5 miles. then on rt. Gleichenia with more abundant lehua, then also on left, some patches of andropogon, some of Gleichenia on either side, with badly large and abundant but open to sparse lehua.
96.9 Andropogon with lehua
9 7.4 coffee on left, then more

gleicheniæ and lehua.
Lots lehuas + clearings.
7 s Andropogon + lehua.
Then gleichenia – lehua.
Paliva
to citrus trees in town.
Left at Jct. Kava tree
Paliva – tree mold park.
Small cane field just
out of Paliva. Garden with
orange trees, many ornamental,
coffee, scattered along this +
exotic trees incl. Eucalyptus
robusta. Patches of lehua.
Then a grove of very large
Albizia falcata.
Asperatum hustmanum
along rd. under these.
Then open lehua with
deep gleichenia.
Then more albizia, with
great surface roots on lava
Denser lehua first albizia
only along road. Then
almost immediately much
smaller lehua with dense
gleichenia (1840 flow). Still
much albizzia along rd.
Then taller denser lehua and
albizia along road. Large albizia
Lava tree park. Stop in
parking lot in rt. rather
dense tall lehua forest
with tangle of gleichenia

linearis var. tomentosa.
Just inside park gate
some planted exotics and
Bidens sp. native ~~to~~ plants of Rhus
sarmica, Tetrachina [illegible].
Albizia falcata.
Neplrolepis abundant + exotic orchid.
Gardenia remyi planted
just past first lava
trees. and a small copse
on rt. in edge of wood (native)
Diospyros ferrea v. sandw.
on small lava mound
in first group of lava trees.
Planted Calophyllum
Inophyllum v. antillarum
On rt. of trail a small
planted Pittosporum hosmeri
in second group of lava trees.
~~Robt~~ Pipturus on rt.
Machaerina angustifolia.

Open area with many
lava trees. Plants controlled
by spraying.

Plant of Metrosideros laxiflora
(253) near little shelter.
At end of loop on rt a
tall Wikstroemia.
Calophyllum inophyllum
but not doing well.
also Thespesia seedling.

On left in lava several Clermontia sp. below: some small Styphelia
1/4 mi. off trail a small planted Rauwolfia sandw. (has) also Sw. Tetraplasandra meiandra
On trail back Machaerina rogersii, a clumps on rt.
On left Casuarina papuana and C. oligodon.
In mt. off trail Cordia subc.
On left Gunnera sp.
Pongelottia hawaiensis, small plant ○ in crack on rt.
Also a plants Piper nigrum on poles, back of them a small Piper methysticum.
Ferns on each side
Broussonetia papyrifera where trail comes back to parking lot.
Asplenium nidus in crotch of albizia ~~between forks~~ in fork of trail at parking lot.

Back of toilets ~~too~~ Psitheadra seedlings. Large crack 9+' dep.
Around parking lot - Gardenia jasminoides, Alpinia purpurata, torch ginger, Acrostichum colored Codyline. planted.
some Hibiscus rosa-sinensis.
Monstera on trees. Banana and "mahoe banana" double bush.

Lava Tree park to Kapoho
Open Gleichenia with very small lehua on 1840 flow.
Puu Honuaula - wooded cinder cone on rt. Much heavily chaparral on lava. Then large coffee plantation on rt. then lehua, Nephrolepis gone on left. Cane field on rt. Patches of forest in older lehua on left.
Cane fields.
Then 1955 vents, spatter cones, and aa flow.
(stop) Bulldozed area observed in 1950 + 1960 has largely been put in Vanda.
Plucked Erechtites val. Lactuca, Emilia jav. Sonchus, Cyperus brevifolius, Euphorbia glomerifera, Vernonia cinerea, Euphorbia hirta, Drymaria cordata, Cyperus compressus, Digitaria chinensis, Ageratum conyzoides, Erechtites hier. Nephrolepis all very common.
On rough flow itself, covered by 1960 spatter, Nephrolepis abundant in cracks, fruiting. (sporos)
Puu Kii, to left of road. cinder cone covered by young

1st par. from b. 74

Down Kii flow. cane growing in areas not covered. Little but Nephrolepis on aa. They came on old flows to Kapoho crater - an old cinder cone cvered by guava brush, some lehua.

Papaya plantation on left. Guinea. Cascuarina, not Pahoa.

Ruins of Kapoho. Cinder cone and cinder beds back of it. Ns veg. Ns mins are old cult. plants of many sorts. The side of Kapoho Crater toward the cinder cone had veg. destroyed almost to small lehuas recovering. Many weeds and ferns. Young casuarina.

Pandanus (new one)

Cassia alata around parking lot. 7 low stretches of sea westward.

Eruption Jan. 13 - Feb. 6.
7 low covered 1925 acres (400 acres ??)

Road Toward sea s. of Kapoho Cr. Through cane fields. Breadfruit trees and abundant banana on s. side of Kapoho Cr. Papaya plantation below crater. Lechwa is abundant.

new flow on left in distance. Road turns toward sea on old lava. Scattered lehua. Much Cocos nucifera. Planted & coconuts. Pandanus becoming common. Beach forks. 1960 flows where it reached sea. Turn back to take other fork. Pandanus forest toward land from beach forks.

On other fork, older lava. Dwarf lehua, Sesbania, Pluchea, on lava flats near coast. Scaevola scrub dominant. Much Sesbania and lehua back a little. Patch of Pandanus. Low low cliff. Nearer beach mostly bare lava. some Scaevola, very depressed. Lesquerella in low spots. The Lesquerella has stems greenish above, reddish underside toward ground, glossy lvs., pink fls. Lesquerella only nearer shore. Much Sambucus expanse on bare lava. Withania, Chenopodium, various weeds near road.

photo

Brackish pools.

Road comes to Kii flow and circles back, through dead lehua & Sesbania to rejoin access road near fork.

brush and sparse lehua. Other little old vents, some with cane on outside. Cane on rt of Kii flow. Lehua across from it.

Pandanus forest at Kapoho Beach Cots - dense, irregular solid stand, 10-15 m. high, canopy open, undergrowth clothed with young Pandanus Pipturus albidus, Psidium guava.

Tangled sp. around edges with Thunbergia alata (white), Canavalia, Passiflora foetida. Sporobolus indicus, Commelina diffusa. Papaya + Nephrolepis abundant edge. Molasses grass. Going back Lehuea scrub some Pandanus. Then sparse lehua with abundant Cassytha.

Trail on Pohoiki Rd.
Low sparse lehua with some Cassytha. Scattered small mango sp. along rd.
Out on bare Kii flow. Lehua No veg. Crossed it. Then low lehua scrub forest to 8 m. dense, with Canthium, Dicranopteris

Wikstroemia. on older a.a. a little Lehuea, Guava. Coccoloba. Nephr. Kalanchoe. Sadleria Scaevola sericea, Pipturus Cassytha. Patches of Pandanus.

Calophyllum grove. House & coconuts. Clear area to sea with coconut. Scrub - guava mango Canthium on it.
Then on both sides Coconut grove with canthium understory on rt. Calophyllum grove on left.
Then mixed forest - mango, Wikstroemia, Pandanus, Calophyllum
Wikstroemia in undergrowth of Calophyllum.
Calophyllum grove - Isaac Hale park. with Calophyllum trees, beach sand.
Back of this sand with guava, etc.
Then mixed guava scrub, forest, etc. Coco, Mango. Pandanus sizable saplings abundant in guava forest.

Low scrub of guava, etc
patches of Pandanus and
Litsea forest. More Lehua
scrub forest. coconut grove
guava scrub with scattered
Pandanus.

Malama-kai Forest
Reserve. Rocky Pahoehoe
lava with low headlands
on sea side. Leaf roads.
Lehua (1-2 m.) + Sty/helia on
mauka side. Some W. sinuosa,
Cassytha, Spathoglottis
Waltheria, Osteomeles.
Passiflora foetida Ischaemum
byronis, Fimbristylis
cymosa,

Below rd - a little bay
Sadleria, much Leaf roads,
Ischaemum comm. Then
a zone of 10-15 m. with
just tufts of Fimbristylis
and [illegible] of Ischaemum.
Then a vegetation-free
zone ~~to~~ 10-15 m wide bathed
by sea ~~spray~~ splash. Cliffs 20 ft.
Spray + splash come
in 10 m. while I was
there with no other guide
sea no significant
amount of whitecaps.
Rocky Pahoehoe surface

photos

From here on considerable
Casuarina but well back
from sea cliffs
Leaf roads on pahoehoe
with a little Lehua.
Then as with much
better veg. Lehua 3-4 m
much admixture of
other things.
More Casuarina around
Mackenzie Park.
More Lehua + Litsea scrub
forest on r.
Albizzia planted
Coconut grove. Back of
it Pandanus - Arduina.
Pipturus, Lehua.
Then Pandanus - Lehua
small cocoa cane on l. ft.
Guava forest with
Calophyllum grove then
less Lehua Pandanus.
+ guava - pandanus.
Eug. cumini. Calophyllum
Malinda.
Clearing with low guava
scrub on left
Coconuts and huts.
Mixed forest largely exotic
Coconut grove on r.
Tiny village. Opihikao.
Cape on left.
wind sheared Calophyllum
with [illegible] etc.

Calophyllum Pandanus.
then with much guava
Lehua forest with Pandanus
Pure Pandanus on st.
Cleared land grown back
To scrub on left - Pipturus
Pluches, guava, etc.
Bananas on st.
Pandanus forest.
Pandanus - Lehua - guava
Pandanus on left, some
admixture of Ramanea
Lehua, etc.
Then 1955 Kaulaan as flow
absolutely bare. (photos 4 & 5)
~~A~~ ~~a lajeuka of~~ Lehua with
a little Pandanus ~~and~~
~~off by a recent flow~~. Then
mixed guava & Pandanus.
Eugenia cumini.
Clearing with guava
lantana. ~~Co~~ Then
Eugenia cumini.
More guava & eugenia scrub
Calophyllum grove.
Guava scrub.
Pure Eugenia. A few Pandanus
stumps. ~~in~~ in ~~to~~ more
guava scrub.
Then ~~to~~ Black as with
scattered & small Lehua
Pure Lehua forest then
1955 Keokee aa flow.

More black as with
scattered lehua.
Apparently only thinly
and not completely
covered by 1955 flow.
~~Kipuka of Lehua~~
Lehua & scrub.
1955 Kilauea aa flow
small kipukas.
~~Eugenia~~ guava
brush with some Pandanus
~~on~~ on left
guava forest.
Open lehua forest on aa. 5-6 ft tall
w reproduction & seedlings of
~~Styphelia~~. Panicum &
Wilstromia.
Extends some distance.
Gets lower, to 2 m. then
3-4 m. & 5 m. low again.
Then very low and
sparse 1-2 m. and after
savane trees and scrub.
Then dense again but low.
Spathoglottis all along here.
Here and there mixture
of W. Polycarpa and guava
suddenly guava scrub
to short distance.
Then open lehua on aa.
on left almost bare aa 100 m.
to sea.
Then low guava scrub
with scattered trees

of Samanea saman
Eugenia. Clumps of Cocos
coconuts.
Jct. Kaimu Beach.
Coconut grove on black
sand beach flat.
to Pluchea send. Guava
Coconut grove on rt,
guava sand on left,
More Pluchea sand.
Then Pandanus & Pluchea.
Coconut grove
Kalapana Park and
village. Wind sheared
Cuphea sand & taller
bare scrub.
Around bank - Pandanus
and Aleurites trees, a few
hau.
In edges of pond - Bacopa
monnieri, Eclipta alba
Hydrocotyle vulgaris??
Commelina diffusa,
Paspalum
Polypodium scolopendria,
Pluchea odorata
Emilia sarcanea & Cattle track.

On dunes 6-9 m. high of black
sand mostly Ipomoea
pes-caprae, Cyperus,
Stenotaphrum americanum
Digitaria sanguinalis, D sp.
Xanthium,

Panicum sp on sand
around pond back of dunes.

Back to Pahoa by upper
road.
Guava brush, with
Pluchea along road
Then Pluchea with
scattered small Eugenia
and a few g. mango on
smooth old lava.
Then an a flow
with lichens and
widely spaced trees
6-4 m. tall, Aleurites
very characteristic, locally
dense.
Then guava brush
with scattered mango
large guava with
larger mango. -
Then Lehua open scrub
forest.
guava mango, with
occasional house with
other trees. Sapindaceae
abundant.
Then guava second
Open with some mango and
Lehua.
Dense to open Lehua
trees to 6 m. Clerodendron
and Antidesma - Psathyrostachys

and other orchid.
Then dense but still
open lehua belt
some of it rather
tall.
Clearing with sparse
guava and Andropogon.
Mango trees.
Then fairly good lehua.
forest 10-15 m.
Kealakekua Forest reserve
Dense 15-20 m. lehua with
Freycinetia etc.
Then 1955 Kehena flow
covers left. Some striking
hapuhus, esp. on right.
Lehua forest.
Opuhehas road.
Lehua forest with Cibotium
Steam cracks on left,
then Kamaili vents of
1955 eruption on r. spatter
cones, skeletons of lehua
killed by gas. Other lehua
below were appa ently
killed, but have now
put forth abundant
short branches. (photos)
Nephrolepis abundant
Prob. N. biserrata.
Ploiches, Pityrogramma
Sussuaea, Commelina diffusa
Agenaturia con., Stachypteris
dichotoma abundant on
roadside & pr cinder.

Mar. 17.

Good dense tall lehua
forest, wet with some
strawberry guava.
Then smaller lehua with
Gleichenia, then tall lehua
again. Some small
banks, & Metrosideros glaucescens.
Good lehua forest
for some distance, with
Cibotium large.
(being subdivided as
Leilani estates.)
Coffee plantations - don't
look healthy. Cane fields
with patches of lehua
with gleichenia and of
dense lehua forest.
Pure coffee on left.
Village and intersection
with Kapoho Rd.

Mar. 18 - KMC - Park Hq.
Open scrub of Styphelia et.
with widely spaced small
lehua. tadlana. patches of
Gleichenia.
Steaming flats - sparse
to dense grass with Vaccinium
Moss.

Then other low lehua forest
Hedychium along road.
Gleichenia.

March 18 - Olaa - Hilo.
mixed thicket with
kukui, lehua, pandanus,
various introduced trees,
Cibotium, Heterocentron,
Hedychium flavum, Psidium
Malvaviscus, sea grape
guava
Melastoma of Acalypha hispida, lehua,
Nephrolepis etc in undergrowth
Cecropia. Heliconias. Sphath-
odea

Thru down to m.p. 5.
then pasture and pasture-
Panicum purpurascens,
Nephrolepis, etc. with
thickets, mango and
eucalyptus trees.
Pandanus forest with
guava, etc. on it
Then mixed brush, largely
guava. Then industrial
District.
Open residence area with
many ornamentals.
Vanda nursery.
Pandanus on ~~left~~, guava
scrub. more industry on left
Airport Jct.
Going into town large
open area cleared by tsunami

about Jct. of 2 parallel roads entering heterogeneous on west side widely spaced pasture mile. and well tree.

Hilo to Kurtzer
Out Rt. 11, Volcano Rd. gen of
Varda nursery residences, etc.
industrial area.
Pandanus thickets with grass,
etc. Farms.
Staenbeck Hwy. —
Mixed thicket with
guava, Heliconia, Cecropia,
some lehua. Roadside
lined with Pluchea.
Waiakea Forest Res.
Melastoma abundant
along rd. with Heliconia
about 4 m. tall. Some Musa.
Open lehua behind this.
Some Sphathodea, some guava.
Cibotium.
Then better lehua forest
with Cibotium under
story. Rather open and
bushy.
Occasional Rhus javanica
along road.
Then open scattered large
lehua with Gleichenia
and Cibotium layer.
Locally lehua is denser.
Occ. Pipturus. Still
much Melastoma. Pluchea
Andropogon along rd.
On right better forest
a little away back from rd.
Steadily climbing.

Melastoma drops out and forest improves but still is a rather open forest. Pteridium still common.
Cibotium prominent.
Lobelia tree. large but not dense. Occ. Freycinetia
Thin forest more open.
Fern layer dense.
Occ. pl. of palms
Forest very
Volcano rd. to left.
Forest very open. becomes very brushy with young lobelia.

Stop at crossroad and old flume. borrow pits.
3500±
Plants in borrow pits:
Lycopodium cernuum
Eupatorium riparium
Machaerina mexenii
Gleichenia linearis & truncatum
Sadleria cyatheoides
Pteridium aquilinum
Spathoglottis
(other orchid)
Stachytarpheta dich.
Andropogon
Sphenomeris chinensis
Nephrolepis exaltata
Tritonia

plants in degraded forest.
Coprosma
Psychotria (Straminea) hawaiensis
Cibotium chamissoi
Metrosideros
Cyanea
Psidium cattleyanum & lucidum
Antidesma platyphylla
Broussaisia arguta v. pallida
(Ag.) Psilotum sp.
Freycinetia arborea
(Ad) Polypodium saffordii
Xylosma
(Ah) Nephrolepis cordifolia ?
Alyxia olivaeformis
Ilex anomala
Rubus rosaefolius
(Ai) Peperomia sp
(Aj) Hypnum plyllum
(Ak) Grammitis
(Al.) Vaccinium
Pelea ~~sp~~. clusiaefolia
(Am) Elaphoglossum sp.
Machaerina mexenii
Cibotium glaucum
Perrottetia sandwicensis
(200 m. on road & n. of st.)
Cibotium menziesii
Eupatorium riparium
Commelina diffusa
Lycopodium cernuum
Gleichenia lin.
Pteridium esculis
P. Lugulare

Walls in ↳ rt. ↳ top of
forest small size -
Lycopodium on rt. also along
down short slope - Pteris aqua.
Cyanea on left.
Note striking variation
in leafsize, shape, texture
pubescence, infl. pubescence
in lobelia.
Nothing different on
road in other direction

0 mile. the forest continues
to be open and filled with
gleichenia etc. dicrotium.
22.9 Group of Pritchardia on
left and on rt.
Forest here about 20 m.
but with Gouldia terminalis,
Pipturus, another cyperus
Athyrium sandw.
Thelypteris cyatheoides ?
Cheirodendron
Gleichenia glauca

7 ron here along Pritchard
occasional Pipturus
abundant shrub at edge
of road, also Coprosma.
Pleurobea ? Hedyotis pinifolia
still abundant
Freycinetia abundant.
Tetraplasandra rare.
27.3 Road to rt. Thin mist left

Forest on ridge crest.
28.2 High, rather dense lobelia
With thick undergrowth
Cyrtandra 2 sp. abundant
Peperomia abundant
Trichomanes Bauerianum
Myrsine cf. sandw.
Labordea sp.
Isodendron sandwicense
Gouldia terminalis
Myrsine sp.
Coniogramme ?
Forest about 20 m. tall
very mossy below
a tangle of fallen trunks
Cyrtandra Broussaisii
Gouldia and ferns
abundant in undergrowth
Lobelia (Cheirodendron)
form closed canopy.
Buddleia common along
road with Isachne,
Pipturus, Tritonia,
Andropogon, Machaerina
mexiae Eupatorium
Carex cognatensis
Cyperus sp. Luzula, Juncus,
Plectrachne (not common now)
Coprosma, Lysimachia cernua, orchid

31.9 Front becomes low + sparse
few large. dibatum, Ludbia
+ gleicheria better developed.
no more palms.

34.4 (4692' el)

35.9 Better forest but still rather
open canopy.

36.0 Rukani Camp gate.
Low lehua forest.
Coprosma. Rubus sandw.

5360'

~~37.0~~ Inside on cleared ground
Sadleria,
Stephelis
Hyptaris
Machaerina
Coprosma. emod.

Grass with scattered
big lehua.

Then open to closed lehua
forest. Cheirodendron etc in
second story
Ferns - Sadleria + Cib.
under this.

More closed but lower
upward.

40 Gods Coprosma emod. at gate.
Forest grazed. Some koa.

koa becomes dominant.
Myoporum abundant.

Gate at 5820'. 1942 flow
Pa lava gray with
lichen - Stereocaulon.
Polypodium pellucidum
Coprosma emodioides
Dubautia scabra,
Metrosideros
Epilobium
Vacc. ret.
Vacc. berberid. colonizer
mostly on disturbed place

Kipuka just inside & at
over aa. Koa low
open scrub forest of
lehua (Metrosideros)
and a mixture of
Deschampsia + Coprosma
emodioides on ground
Trees 3-5 m.
Stephelis
Lyc. venustulum
Gahnia gaz.
Phlegmariurus chinensis
Gleichenia linn. Sm.
Sadleria
Carex Isachne?
Fragaria Lyc. cernuum
Vacc. ret.
Vacc berb.?

This begins about like last just outside flow. Open, grassy Lava lehua. Wagneria. Hyperium japonicum. In decadent hoa forest considerable reproduction of lehua. Cenrodendron Clerodendron ~~tomentosum~~ Cibotium. Dryopteris pal. Sadleria Last is going fast. Lehua. of what happened in Maui.

Lehua forest outside middle gate - astelia Blythetia in open spots.

Stop once here.

Just clear and - in cleared area - a second landscape of Sadleria and Dryopteris

46.3 Gate
5 ~~5.3~~ down & palms. 2200'
57.7 cross road. ~~2100'~~ 1900'
59.1 rd. to Mt. View.
Broken down forest - scattered lehuas, thickets of Coprosma, Pteridium, Gleichenia Cibotium

these open areas. Then dense young lehua. Then cleared land, abandoned farms, etc. Heteropogon thickets, Gleichenia, Tibouchina, tall palms. Patches of rather dense small lehua. Cleared area of Andropogon - scattered poor small trees, clumps of sapling and Gleichenia.
Then open regrowth of lehua - Panicum purp. + Gleichenia. Grass.
Then cane fields.
Several flowers.
62.0 Highway.

1961 Hawaiian Is.

March 18 - just ~~outside~~ below 1942 aa lava flow on Kulani - Mauna Loa Road in open ~~forest~~ forest on old lava.

41539a Coprosma ochracea var. rockiana occasional ~~in~~ in understory

1 40a Vaccinium ~~haleakalae~~ V. ~~disjunctum~~ common, with V. reticulatum

March 18 - ~~same~~ kipuka in 1942 aa lava flow near Kulani - Mauna Loa Road. in low open metrosideros woodland with Deschampsia.

2 41a Gahnia ~~javanica~~ gahniaformis common

2 42a Coprosma ~~ochracea~~ ~~rockiana~~ ~~occasional~~ ~~in~~ ~~understory~~ ~~1 40a Vaccinium haleakalae V. disjunctum common, with V. reticulatum~~ ~~March 18 - same kipuka in 1942 aa lava flow near Kulani - Mauna Loa Road. in low open metrosideros woodland with Deschampsia.~~ ~~2 41a Gahnia javanica gahniaformis common~~ ~~2 42a Coprosma ochracea var. rockiana occasional~~ ~~2 43a Coprosma ochracea var. rockiana Oliv. occasional~~ ~~1 44a Coprosma ochracea var. rockiana occasional~~ ~~1 45a Styphelia common~~ ~~1 46a Fragaria ~~chiloensis~~ ananassa? rare~~ ~~2 47a Carex rare~~ ~~1 48a Lycopodium venustulum rare~~ ~~1 49a Vaccinium reticulatum rare~~ ~~1 50a Vaccinium reticulatum Sm. common~~ abundant, forming a large proportion of ground cover

2 43a Coprosma ochracea var. rockiana Oliv. occasional

1 44a Coprosma ochracea var. rockiana occasional

1 45a Styphelia common F. ~~var~~ f. alba (Cham.) Rydb.

1 46a Fragaria ~~chiloensis~~ ananassa? rare

2 47a Carex rare

1 48a Lycopodium venustulum rare

1 49a Vaccinium ~~reticulatum~~ near pilosum Sleumer

1 50a Vaccinium reticulatum Sm. common

1770'
5820'

Oliv. shrub 2.5' m. tall; fruit vermillion, fleshy.

pleianum shrub 0.3 - 0.4 m. tall.
1790m
5860'

(gand) Heller tufts; fruit hanging, black, glossy.

— creeping shrub to 1 m. or more long; fruits black, glossy, juicy.

— shrub 1 m. tall

Oliv. shrub 0.7 m. tall.

shrub 3 dm. tall; flowers white, fruit dull maroon.

— petals white; fruit white, achene almost superficial.

— small tufts

creeping

— dwarf shrub 2 - 3 dm. tall;

— fruit dull maroon, fleshy.

dwarf shrub 2 - 4 dm. tall; fruit dull orange to vermillion, fleshy.

March 18 - Road to Kulani Prison Camp. ~~2~~ mi. below Prison Camp
in dense wet Metrosideros forest on old lava

41557 Cyperus haspan L. sp. new to Hawaii
2 abundant in excavated area at side of road

3 57a Abutilon auritum (Wall. ex Link) Sweet det. Fryxell, ~~det~~
common in excavated area at side of road

1 53a Peperomia chamissoniana
common in cleared area along road

2 54a Piptemia argentea var.
abundant in cleared area along road

3 55a Fuchsia magellanica Lam.
~~also~~ common on roadside

6 56a Gouldia terminalis var.
common in undergrowth

3 57a Trichomanes (Cystisoptera bonariana (Gaud.) Copel. fo. D. Palmeri) 2/56
occasional, terrestrial.

1 58a Cyrtandra
rare

1 59a Nephrolepis cordifolia
occasional, epiphytic.

1 60a Cyrtandra
very common

3 61a Coniogramme pilosa (Brack.) Hieron.
occasional, terrestrial

3 62a Cyrtandra
common

1 63a Astelia menziesiana Sm.
occasional, terrestrial

2800'

shrub 1.5 m. tall, flowers white; fruit black, fleshy.

shrub 1.5 m. tall; fruit white, fleshy.

slender shrub 2 m. tall, branches arching and pendent; flowers pendent, calyx red, corolla deep purple.

slender tree 4 m. tall, fruits dark blue.

~~shrub~~ slender shrub 2 m. tall, flower white.

erect fruit white, fleshy

erect shrub 0.3 to 1.5 m tall, fruit white, translucent. flowers greenish white.

4 1 5 64a Sterogyne
4 common

Mar. 18 - Road from Hilo ☆ Kulani Prison Camp, 9½ mi below Prison Camp
in moist Metrosideros woods on lava 2000'

x 65a Thelypteris
occasional in palm grove

2 66a Gleichenia glauca
rare

3 67a Coprosma pubens Gray
common

3 69a Pityrogramma (Hemionitis) hawaiiensis
common

1 70a Coprosma pubens Gray
~~rare~~ common

March 19 - Road from Kulani Prison Camp to Hilo, 11 miles below Prison Camp
in rather open Metrosideros forest 600 M. 1900'

3 71a Cyanea
common

4 72a Coprosma pubens Gray
common in opening

3 73a Cyanea
common

3 74a Antidesma platyphylla
common

scrambler, flowers red purple.

6700'

fronds rather closely spaced on horizontal rhizome.
— fronds tangled, elongate, glaucous beneath.
slender shrub or small tree 4 m. tall.
— shrub; leaf nerves dark red beneath
— shrub 2.5 m. tall;
— flowers white.
shrub, flowers greenish.

shrub 1.5 m. tall, flowers purple without, ~~white~~ white within.
— slender shrub 4 m. tall

shrub 1.2 m. tall, flowers purplish green without, white within.
— shrub 3 m. tall.

4 | 5 | 75 Cyanea
occasional

3 | 76 Hymenophyllum obtusum
on tree trunks

2 | 77 Pstelotum complanatum Sw. det D. Palmer 5/96
common on tree trunks

1 | 78 Grammitis Tenella Kaulf.
common on tree trunks

1 | 79 Polypodium
rare, on tree trunks

2 | 80 Psycholrtris (Straussia) Hawaiiensis
common

1 | 81 Peperomia
common, epiphytic on logs and trunks

1 | 82 Polypodium saffordii
occasional, epiphytic

1 | 83 Polypodium tamariscinum
common, epiphytic

1 | 84 Hymenophyllum recurvum

March 19 - Hilina Pali
on bare lava ledges

1 | 85 ~~Rosa~~ Plectranthus australis
rare

1 | 86 Dryopteris ~~decipiens~~ decora Diels var. decora
common

1 | 87 Linaria canadensis
common on patches of soil above cliff

March 19 - Kipuka Nene

1 | 88 Veronica ~~hederaefolia~~ plebeia R. Br.
in openings

shrub 2 m. tall flowers dark purple without,

bending downward

leaves dark green above, red with green vein margins beneath.

680 m.

stem bluish below, calyx deep purple, corolla pale lavender.

900 m.

prostrate, forming mat.

March 19 : area bet. KMC and Observatory -
to corner fairly dense low scrub with

after corner sparser scrub. almost desert, or loose tephra scattered small lehua.
Enters along crater rim road about ~~half way~~ ¾ to KMC.
Then dense scrub again.
In sparse scrub Dendrella is common; less so in dense scrub. Baccharis also.

KMC & chain of craters.
Steaming flats.
Scrub forest with gleichenia dense forest at left. & Volcano House. Many ornamentals around V.H. & residences.
Yellow ginger & Kahili ginger.

Toward Kilauea Iki - rather dense but scrubby. Then dense and taller - 7-10 m.
Open stand of obtusum, larger ones on roadside. Fuchsia on roadside.
Beyond Thurston Lava Tube parking lot forest is a little less dense, perhaps lower.
Better Cibotium stand toward Kilauea Iki. Beyond K.I. overlook

road almost no ~~th~~ fern layer.
Pct. of chain of craters rd. damage to forest from 1959 eruption - to Kilauea Iki crater - mechanical damage from pumice.
Open scrub forest with shrub layer. Dodonaea notable.
Puhiwiwai Crater - stop.
Low lehua forest around it with grass, tufts of ~~Dicranopteris~~ Sphagnum, Hypolepis, Hypolepis polypodioides, Hypolepis elongata, Carex macloviana, Kadleria, etc. Styphelia, Wikstroemia, Vaccinium shrubs.
On ~~top~~ sides more open with gleichenia.
Nephrolepis abundant on ledges and top of talus in crater. Trichomanes just over wall on crater rim, shaded.
Polypodium pellucidum.
Forest lower and more open on down road. Shrub and Kadleria layer prominent (west crater). Patches of some gleichenia, but local areas only.
Then, near hiking path road, open fern ~~shrub~~ with scattered lehua bushes
Then section through

bubbly?

cinder cone, with iridescent
scrie.
Low scattered trees + scrub.
Heake Crater on left.
Very open scrub forest.
to scrub with scattered trees
Coprosma, Ilex, Pipturus.
Metrosideros shows more
variation here.
Paraahi Crater
Plains grandiflora established.
Dodonaea. Ostemeles. ~~etc~~ Sporobolus
Coprosma ernodeoides.
Gahnia jav. on edge of crater.
Open scrub forest to
scrub and scattered trees.
with Gleichenia.
Aloi Hot area. Steaming ground
Low open grass and
gleichenia, scattered tiny
shrubs. Andropogon. Aristida
Eragrostis cernuum.
Aloi Crater. Forested.
Andropogon Metrosideros
savanna.

From Halululu on left.
Then open forest with
gleichenia

Aloi Crater - walls and
talus more or less wooded
floor of lava pool with
very sparse forest.

Clermontia bush on
left roadside just
before Kaao Nui o Hana has
come up. Lava bubble.
Santalum paniculatum
or rt.
Then taller forest
with much Gleichenia
Forest gets thicker
just before end of
road. 2914'. Makaopuhi Cr.
Low forest of Cibotium
around crater. At overlook
a bush of Gouldia terminalis
v. antiqua (?). Leaves clean
around parking area
Nephrolepis exaltata
abundant. Weeds.

Machaerina apparently
common to abundant.
Andropogon general in
open areas.
Dubautia very common.

Aloi flat started steaming
in 1922?

Hiking Pali Rd.
scrub with scattered trees
Leaves silvery.
Lava open bubbly pahoehoe
Styphelia Dodonaea
Dubautia, Machaerina etc.

Much bubbly, Rebrochot with very sparse scrubs, scattered tree.

Varies much in density from open scrub forest to desert (esp. lower down).

Then an area of open forest of trees 20–30 m. tall and up to 6–7 dm dbh. Kipuka here.

Understory of Sophora 2–4 m high here. Much Commelina diffusa Bidens pilosa, Jasminum indica, Pteridium, Cenchrus bebecarpus, C. ciliaris. etc. Occ. Styphelia + Dodonaea. Much Kolbis planted. - seedlings 1–2 m. tall, unbranched.

plot of

Farther over this forest is more or less closed

Locally Styphelia is abundant in thicker parts of open forest and Sophora to ca 3000'.

Then open Pahoehoe lava desert. Then more forest. Then more desert.

Then savanna of Andropogon, Heteropogon contortus, Melinis, Pteridium.

Apparently on a slightly older pahoehoe with more soil & rock. Large lehua scattered irregularly, esp. on the tumuli.

Pellaea ternifolia very common on tumuli in crevices.

Carex macloviana, Psilotum nudum. Cladonia on bare surfaces, also Parmelia. Pteridium. Many weeds. Bidens pilosa var. white rays.

Kipuka
barely above Pahoehoe
with Sophora.
gets thinner farther on.

Hilina Pali. Great fault scarp 1500' high, covered by grass mostly Andropogon glomeratus, Thelinis. Pellaea, Dryopteris, Waltheria, Bidens pilosa, Indigofera, Pteridium, Emilia, common. Various other weeds.

non seedlings planted

On cliff are strips of lehua forest.

Coastal flat below seems to be all grassland with a few scattered bare trees.

Some areas to right gray and black, without much grass.

On ledges of cliff itself occ. Sadleria, Pityrogramma, Sphenomeris, Lantana, Nephrolepis of 2 kinds

Goats seen below.

Above Pali lehua forest in both directions in distance, although apparently sparse to with denser spots.

March 19 - savanna between Hilina Pali and Kipuka Nene in open grassland

3 41589a Sida (Herb. Sloane)
3 90a Sida
3 91a Sida
local colony on pahoehoe

March 19 - Hilina Pali Road above Kipuka Nene in open pahoehoe ~~lava~~ Metrosideros with scattered big ~~trees~~

1 92a Emilia javanica
common in crevices
1 93a Conyza canadensis var. ~~pinifolia~~
common in loose soil pockets
1 94a Linaria canadensis
common in soil pockets
1 95a Pellaea ternifolia
very common in crevices
1 96a Festuca myuros
common in soil pockets.
1 96b Bulbostylis capillaris
abundant in sandy patches
March 19 - Pu'u Huluhulu Crater
1 97a Carex wahuensis Mey.
~~is~~ rare in low grassy Metrosideros forest

March 19 - Hilina Pali Rd. just below ~~Alae~~ crater
in open scrub forest
1 98a Scaevola Gilaucea
H 99a Scaevola Gilaucea Hey.
very local H. S. mauiensis var.

850 m.

shrub 1.9 m. tall, very definitely woody; flowers dull orange. (extreme variation in leaf shape)

950 m.

flowers pale brick red.

flowers white.

1100 m.

tufts

1000 m.

~~It~~ shrub 1-1.5 m. tall, leaves thick, stiff; flowers white with dull yellow tube, turning dull yellowish.

from Crater Rim Dr. Picture area

Mar. 19 — Boardwalk —
Lehua forest recovering from fire damage sending out immumerable small branchlets on old branches and trunks. (photos) Road covered by pumice. (note speed limit sign) Sadleria survived Dryopteris a Cyperus Gerifolius well developed on pumice. Astelia and Coprosma ernodeide on it a few feet off trail. More and more dead lehua and less recovery. Pteridium on left, then a st: just Before last living lehuas.
Cibotium sprouting on ends of last living lehua.
Skeleton forest. many fallen trees. No ferns in this part. Along where material is scoriaceous a few tiny seedlings in the voids
Then a few at base of standing dead trees, more and more near to second platform
Then an area where Rubus ~~was~~ is beginning to spreading in low recovering forest in open spotty. also Cyperus of
*Cyl. bur. bracteus, Dicranolepis? Astelia Coprosma ellipsoidea

of Kilauea Iki Pk. on

this near end of walk.
View of new lava pool and collapsed face of cone from platform at ~~sign~~ edge, off road.
Note Byron ledge, separating Kilauea Iki from Kilauea Caldera.

Here to Hq excellent treefern layer in place. Thick lehua forest. Occ. Ilex.

Mon 19. Wright Rd. (Bt. 1428)
Dense low lehua forest on st. Rubus penetrans and R. sp. on side.
Tebouchina.
Clearing with Pyracantha
Rubus sp. Cupressus ~~sp~~ lusitanica for Christmas tree
Cupressus also along road.
Cleared tall lehua forest. Then open lehua with well developed Cibotium stratum.
More clearing. + low regrowth.
Dense lehua on left, Opened up on rt. subdivided.
Then Very open and tangled Cibotium large on both sides.

Rt. angle turn. Forest has been charged to pasture to

Roberts place.
Pit for cesspool -
Very dark soil at top with thin layers of scoriaceous
gradually gets redder downward till it is bright red brown. Then suddenly a firm friable gray layer.
In back - an open forest of large spreading Eleva 20 m.; with an undergrowth of Libocedrus
Piptanus
to 2 m.
The Piptanus lines the road perhaps resulting from opening up.
Tree ferns Dicksonia, Peperomia, Astelia and on its base, ~~Elaphoglossum~~ Cyanea. Some Coprosma.
Fragaria abundant on ground.
Clearing with Lastrea dilatata. A Pteridium on other side. Many trees.
Then trail into forest again. Coniogramme.
Athyrium japonicum.

similar.
Chaerodendron on left.
Physalis pruin. in trail.
Cibotium glaucum large well developed. Fruiting.
Rumex giganteus at first in trail and on down. Pteridium on left hand side.
D. Cheilanthes cryptheroides common. Athyrium japonicum in road.
Dicksonia squarrosa abundant in many fallen trunks.

Astelia, Elaphoglossum hirtum, Tree ferns, Coprosma etc. common Asplenium on left hand. Clerodendron also.
Also Gramnitis, Trich. bonin. Asplenium caudatum?
Cyrtandra, Alyxia ovata.

On left by.
Asplenium on trunk on left 50 m. in from fork.
Rubus rosifolius and Vaccinium calycinum over. Coprosma R. rosaefolia
Coprosma on left (large 4ft. stem) at second running fork.
Solanum nigrum in trail.

Ilex & Clerodendron.

other Weeds in trail
Ludwigia
Cuphea
Lonchus
Hypericum
Cyperus temporalus
Pluchea

March 19 - Wright Road Farm Lots, just below Kilauea in Metrosideros - Cibotium forest.

1140
1140 m.

41600 Asplenium
rare, epiphytic

1 01 Asplenium lob lobulatum Mett.
rare, epiphytic

2 02 Asplenium A. falcatum Lam.
occasional, epiphytic

2 03 Asplenium A. falcatum Lam. var.
occasional, epiphytic

1 04 Phytolacca brachystachya
rare on roadside

flowers magenta, stem and leaf veins purple.

2 05 Ludwigia
in middle of trail

– prostate, forming mats.

2 06 Peperomia
common, epiphytic

erect, leaves maroon beneath with green veins and area along veins.

2 07 Cyrtandra
occasional

– erect shrub 1.7 m tall

2 08 Leucosia chamissoniana
locally common along road.

– flowers white.

4 09 Rubus
common in cleared area

shrub, flowers white with purplish tube; fruit black, ~~canes~~ primocanes erect, 2 m. tall, floricanes arching and sprawling, flowers pinkish white; Berries yellow, edible

4 1 6 10 Lotus
1 very local in clearing

Mar. 20 - akaka Falls

2 11 Psilotum complanatum Sw. det D. Palmer 8/910
epiphytic on mossy metrosideros trunk

2 12 Eugenia
~~Lo~~ planted on edge of gorge

1 13 Alnus nepalensis D. Don
planted on edge of gorge

Mar. 20 - Manna Loa Trail
Scenic Drive, above Kapulena Pauahi
in Open scrub with koa
patches

2 14 ~~Dica~~ Panicum tenuifolium H. & A.
very common

1 15 Carex macloviana ssp
rare, in grass tussocks

1 16 Carex ~~macloviana~~ wahuensis ssp Mey.
rare

2 17 Deschampsia ? nubigena Hbd. 2.b
very common

1 18 Bromus catharticus
local in disturbed weedy area
in koa grove

1 19 Anthoxanthum odoratum
local in disturbed weedy area.

1 20 Holcus lanatus L.
local in trail in shade

forming a dense patch; -
flower bright yellow;
"giant trefoil".

stems horizontal with
distal parts pendent.
tree 10 m tall; stamens white.

tree 10 m tall; leaves grayish
green beneath.

3,610 ft.
6662'.

dense tufts.

dense tussocks.

erect

1961 Hawaiian Is

Mar. 20. - KMC to Bird Park and Truck Road.
Open low lehua with Styphelia - Vaccinium scrub
Occ. small Santalum.
Sadleria, Dodonaea.
Same as road to Bird Park.
On old Pahoehoe.
Down hill the lehua gets taller, still open.

Mauna Loa Strip, Scenic Pt.
Low admixture of koa.
Young koa at Pt. Grass at Pt. Andesite. Sophora is the low dark tree. some Sapindus. The Hypolepis on the right.
Then patchy koa and large lehua.
Dodonaea is dominant in shrub layer.
Excellent open lehua forest. with Dodonaea shrub layer.
Then very good koa Sapindus forest with tall shrub layer.
Then excellent koa forest in places almost closed. Occ. lehua and rain.
Open lehua forest then koa.

Koa savanna with patches of young koa forest. Open Dodonaea scrub, with grass and Pteridium
A hapuu to the left.
Large area of Dodonaea - Styphelia scrub in places closed.
Then a patch of koa forest. Then irregular koa park-land and savanna, with grass and scattered bushes, mostly Styphelia, some Dodonaea. Occ. Senecio.
Koa patches, mostly quite young. in between grass with Pteridium. Then area with koa reproducing, and some Styphelia.
Area flow. Then more grass and patches of koa. Then grass and bushes. Good light alt. scrub, mostly Styphelia, at 5000'. closed to quite open, & shrub savanna Styphelia with a little Dodonaea.
Patch of open forest, koa, lehua, mamani.

with young hoa above. Scrub with scattering patches of young hoa forest, then rather dense, usually young growth around a few old trees. Open scrub on left and between these patches.

Then scrub with scattered sophora, often small hoa patches.

Shrub savanna with grass Pteridium Dianthera. Plants are Styphelia.

On a flow on rt. cross it. Scattered Styphelia Ctenomeria ericoides

On left open scrub hoa forest with Dodonaea, Sophora Megapotamica, irregular but closed. hoa dominant and reproducing abundantly. Some open grassy areas with Styphelia.

Then a hoa park land. large spreading trees and patches with grassy intervals, with scattered Styphelia.

Then a patchwork of scrub and hoa forest patches. Lava is matrix, often to almost closed. Scattering Sophora.

Then mixed low woodland of Sophora, veg Styphelia patches of dense young hoa. patches of Styphelia scrub. More scrub than hoa.

On flow on left then cross it. Scattered sophora & Styphelia

Then a mixed open scrub of Styphelia, Ohamahi, hoa, with some Dodonaea, Vaccinium a very few scattered small Ieheas.

This gets lower and more dense ahead.

End of rd. at 6662'.

Magnificent view of Kilauea, Halemaumau. patchwork of forest, grassland between here and Kilauea. High alt. scrub in foreground.

Plants in scrub

lg Acacia koa
lg Styphelia douglasii
a Vacc. reticulatum
a Deschampsia.
lg Pteridium
a Hypochaeris radicata

c Sophora chrysophylla
a Styphelia tameiameiae
o Rumex acetosella
lc Sporobolus elongatus
c Pellaea ternifolia
c Coprosma ernodeoides
c Asplenium dichotomum
c Carex macloviana
c Dodonaea viscosa
c Carex sp
lc Gahnia jav.
o Metrosideros
l Geranium carolinianum
l Xanthoxanthum odoratum
l Holcus lanatus!
l Bromus catharticus (mitioid)
l Raphanus sativus
l Plantago lanceolata
c Oxa (a Rumex?)
c Verbena bonariensis

Grave of hoa around pavilion.

Vaccinium very variable.

Many pigs in area, doing extensive damage.

2 photos of scrub. rest of roll on pig damage.

Goat droppings seen, but not fresh.

Mostly weathered pahoehoe flows, pockets of soil.

Mar. 20 - Hilo.

Tour of airport, on rt. a very large jacaranda with severed trunks, showing natural grafts.

Hilo - Akaka Falls. 2:30.

cross river.

breadfruit tree on left

Coconut breadfruit, mango on

Rt. Row of small Melaleucas

Royal palms on left above

Giant overpass.

Sugar mill on rt. note order.

Road goes along top of sea cliffs. Gleichenia on banks.

Cemetery on left Cassia glauca on rt. Cane fields.

Wooded gorge

Second gorge. Breadfruit a rt on bank of gorge.

3rd gorge. Rhododendron. Mucuna.

Casuarina windbreak along cliffs.

Small gorge with grass bank.

Breadfruit here and there.

Mango trees also common on edges of ravine and rough ground.

Cane fields + villages.

Albizzia much used as ornamental

Small clumps of bananas.

Rhus javanica occasional on edges of cuts + cliffs.

Nephrolepis on road cut.
Eupatorium inparium
Henrosa turn off -
Fine breadfruit tree on right as we enter town. Avocado. bananas. Breadfruit common.
after double Turn, Macaranga macrophylla on left as we go up hill. Many Spathodeas ~~orchid~~. Hibiscus hedges. Azalea. many other ornamentals.
Cane fields
Parking lot. Dense row of Campylodiscarpus lutescens beside lot. large Eucalyptus robusta, Albizia sp. at lot.
Leptospermum under Eucalyptus.
Ficus paramica in thicket by wall bet. lot and grog.
Numerous planted ornamental shrubs.
Circle path - Turn right.
Clump of giant Heliconia.
Torch ginger
Selaginella sp. on bank.
Coffea tree on rt. below bridge.
Bambusa arundinacea ~~sp~~ by small stream.
Azaleas. Ardisia sp. banyan

Almost nothing native except occ. Cibotium, Psilotum Gleichenia Psychotria
Sculpins on Cliff opposite below falls.

Laurencia
Dieffenbachia
Phyllodendron sp.
Pittosp.?
Cecropia (on cliff in front of falls)
Solandra
Costus
Monstera large vine on stairs beyond falls.
Cordyline - row along path + stairs beyond falls.
Melastoma in thickets.
Eupatorium inparium
Polyscias guil.
Brassaia
Impatiens sultana
Alpinia speciosa (beyond end of b.)
Eugenia sp.

Lehua grove on top of hill and on ridge to Kahuna falls. In this second grove ~~Cat~~ a clump of Astelia, also ~~of~~ and Psilotum sp. and Polypodium tamariscinum? graminifolium on mossy trunks. Lycopodium ~~not~~ phlegmarium on arched root at branch to toilet above Kahuna falls. Elaphoglossum sp.
A small Agave on bare of tree just off. and beyond gulch off Kahuna Falls
Pteris cretica on steps by pavilion

Rhus jav. on edge of cliff below Kahuna Falls overlook. Stairs along wall of walk back toward parking lot.

Cois.
giant clumps of Bambusa on trail up at end of railing above small bridge.
Oplismenus pendulum and Eupatorium glechonophyllum on lehua trunks
Rhus jav above trail in spots.
Adiantum aneatum on cut.

March 21 KMC - Kau - Kona. 5:30 9:35 420

Low open lehua wood, or Styphelia Dodonaea scrub with scattered small lehua. Some koa regeneration at st. beyond Bird Park Rd.
Beyond camp ground (Eucalyptus grove) hapuhas can be seen on hills across depression bet Kilauea & Mauna Loa.
Mauna Loa viewed forward and to rt. Grassland on lowerslopes, scattered trees.
Lehua becomes sparser
36.3 as lava on rt. shows road cut thru the flow - aa beds on both side with scattered bushes for some distance - to Ozeromelea ave.

beards on rt across lava beds in smooth and grassy with trees in ravines and some spots.
Asp Rhus lichen, Styphelia, Vaccinium, Dodonaea

Lehua forest in depression at foot of scarp to right. approaches the road - also grassy scarp much closer now.
Occ. patches of planted Eucalyptus on grassy slopes of scarp.

End of aa flow.
Old pahoehoe with scattered bushes. Then open scrub lehua forest.
mp. 41 patches of lehua and of Dodonaea scrub.
Rolling grasslands on lower slopes to right, scattered bushes.
On left a loose mixture of Dodonaea scrub and lehua thicket.
cult. pastures to right.
Pahoehoe with rather very sparse irregular scrub. Lehua trees bleed at tops.
In distance on right Mauna Loa slopes covered by koa forest.

mp. 44 Patches of poor scrub below
forest. Above scrub a
45 old pahochoe
Pahoehoe to rt. grassy
with scattered small planted
trees
Then an area where most
of trees are dead. Large
grass, scrub on left
Lower slopes of Mauna
46 Loa densely wooded here.
Most trees on flats
here also dead (planted
trees)
Cane fields on slopes to
right.
47 Beyond here most trees
still living. Open brushy
pasture with thin
Dodonaea scrub, scattered
small lehua.
Cane fields continuous
48 on slopes in distance to rt.
Old pahoehoe with sparse
Dodonaea, occ. Styphelia, - then
low, 1 m. scattered lehuas
2-3 m tall. Some Andropogon
and other grasses.
View of South Point ahead.
Eucalyptus plantings in
cane slopes to right.
49 Lantana scrub, open
to closed, some guava, in
pastures. Some Schinus.

grevillea wind break to
50 left. Kamanea and more
grevillea on rt. Heavily
grazed pasture.
Another wind break of
Eucalyptus & Casuarina.
Pasture with numerous
51 scattered kamanea.
Lantana to left.
52. Pahala rd.
(55-55.5') Eucalyptus planted around
village. Mill to right.
grass below village is
mostly Panicum maximum.
Many ornamentals in
village, 2 large Cycas
circinalis in rt or road up hill.
(alt. 171). above town
planted mixed pasture
and cane fields. Much
Eucalyptus, now along rd. mt.
some kukui.
Cane fields. Planted patches
of forest on steep slopes & left.
Planted woods in ravine.
Some native woods around
head of cirque-like valley
to left. Much Eucalyptus
planted around Cherry
Village, Kapa'apala.
Some native ~~trees~~ trees
under Eucalyptus.

Ward Valley

Forest around head of this valley is almost pure lehua, large trees 20+ m. 3-4 dm dbh, rather open in spacing, almost completely lacking epiphyte. Psilotum nudum seen, but rare. Occ. Psychotria hawaiensis. A solid understory 4 m. tall of Gibsturtia glaucum. Eclaisiella abundant locally. Athyrium sp. also. Piptrurus and ? Sodenia common around edge. Some Rubus rosaefolius. Many vines, Ipomoea indica etc. around margin.

This forest has an appearance quite different from ordinary lehua forest. It is not var. incana, but a less condensed type. The complete lack of moss and other epiphytes give it a thin appearance.

This is on a residual steep slope with rock exposed in gullies and in places a ridge. Soil fairly well developed.

Talus at base of this slope with rocks in it has been cleared and planted, very recently to coffee, with catch crop of dry land taro.

70.6 Highway, again at Kaloko.
2600' Pasture with kamano. Leucaena. occ. Prosopis. Eugenia ? cuming along water course.
I en open grassland with very few trees extending down gentle slopes toward sea. A green depression between here and sea. More pasture with kamano and scrub. very local. Much lantana with very scattered Leucaena.
73.8 Patch of Kukui surrounded by Leucaena scrub.
~~Kaloko~~
Beyond Punaluu rd.
a a lava with Leucaena, lantana, Schinus scrub. Some Opuntia. Several of these old a a flows.
75.4 with Canthium common.
75.8 Then a rather fresh very rough a a flow with scattered low lehua..
76.4 Extensive low gray Lantana scrub on old pahoehoe. Scattered Canthium and Schinus, Leucaena. A few windstunted Prosopis on left. Patches of thick Leucaena scrub. Some grass.
77.7 Rather fresh a a with only

very widely scattered
~~#~~ low Myoporum, some
Leucaena and Pluchea.
Then treeless grassland
with some Prosopis.

79.1 Hutchinson sugar mill.
Dry slope, grassy above
& st. mostly Leucaena
scrub with Prosopis along
road.
Then grass with scattered
Prosopis, on rather steep slope.

80.5 Vast treeless grassy slopes,
with cattle. Treeless
grass with occ. small
Leucaena shrubs.
Small ranch houses with
trees.

82.3 Naalehu.
Sugar on rt. pasture on left.
Then thickets of Lehua,
with some guava etc.
in places forming a dense
scrub 4 m. and high.

84.6 Village. Waiohinu?
Coffee. Grevea Lar.
Then hills covered by
Lehua guava thicket.
for some distance, occ.
trees of Eugenia cumini locally

87 Coffee plantations, planted
Eucalyptus. Cattle, etc.
locally. Much Lehua.
Lehua becomes more comm

87.6 Open stand of small
Lehua. Locally much
Lehuinus. Planted
Eucalyptus, etc.

88.4 Pastures with scattered
medium Lehua.

88.7 South Point Rd.
grave brush along road,
pastures with Lehua away
from Rd. Planted Eucalyptus
groves and rows.

89.4 Fairly dense but low
Lehua on 1604 flow.
more scrubby and sparse
in places, ranging from
1 to 3-4 m. tall.
Then Kikuyu grass
pastures.
Mere lava, this rather
bare. ~~#~~
1954 flow is bare pahoehoe
with depressed patches
of Dubautia scabra, very
sparse ~~#~~ small Lehua,
Psilotum nudum tufts,
Styphelia bushes up to
~~2~~ m tall in sheltered spots.
Nephrolepis exaltata
in crevices or cliffs.
Cladonia tufts abundant.
Polypodium pellucidum in cracks
Rhacomitrium mamosum
deep crevices, Sadleria rare.
Vaccinium rare, rare in
rough places.

Very locally in low spots a little grass Carex, Eleocharis, Lobinus. Hypochaeris, Lactuca.
Rumex - shrub, along rd.

Then apparently slightly older pahoehoe with larger lehuas.
Then still older, with grass. Then open forest with Styphel & small aa. trees 3-5 m. tall. Less myoporum.
Then bare 1823 aa with grassy hapuka with scattered larger lehuas, much lichens.
On the aa a very few Sadleria, near two little lehuas. Mostly a barren black clinker surface.
Being crushed for road metal.

9:7 Kapuka of older aa probably 1832, with scattered small lehuas.
1907 aa has no plants but a small hapuka or two of older lava.
Then are older, brown aa flow with scattered lehua 2-5 m. tall, very gnarled in some places rather closely spaced, a few Sophora.

9:3 and older grassy pahoehoe surface, scattered lehua. A kapuka patch.
Then a manuka woodland with occ Dracaena, Canthium etc.
Then tall open lehua forest on aa. no undergrowth except scattered Dodonaea, etc. almost closed in places.
Patch of mixed scrub - Sophora, Dodonaea, Osteomeles, etc.
Then tall lehua forest closed & open, some other trees, on aa.
Gets lower and thicker:
Then a bare aa flow, 1907 with conspicuous lichen growth, scattered small lehua (1 m.), Sadleria, etc.
Then older aa with open small lehua forest, 3-4 m. tall.
Then larger and denser, also on old aa. Stature varies locally, also density and undergrowth.

99:5 Then tall dense lehua, a few other trees in with it, but very few, locally rare.
aa. Grange - Lester.

Manuka Park
grassy with planted trees
both native and exotic,
named. Pavillion, tables, etc.

surrounded by dense tall
lehua forest on very mossy
ag. Paleaceous rebbles common
on surface. Nephrolepis exaltata.
Coccculus, Wikstroemia
Pittosporum hosmeri
on at just off trail 10 m.i.
thin tangled undergrowth
of Lantana, guava
Osmanthus about 15-20
m.in. Many small
Psychotria hawaiiensis
Piptrums, a few Cibotium
a tall slender Reynoldsia.
alphitonia on rt. 100 m.f. in.
Dryopteris abundant
on ground, esp. on trail.
Asplenium caudatum
on ground. Linaria cymbalaria.
Mimosa sp. Canthium —
shrubs at end of trail.
Alyxia ovata
Peleo sp. Psilotum nudum
on ground.
Antidesma hosperus
Gouldia terminalis
Rhaius grandifolius
Polypod. thunbergii

Coprosma sp. (aff. fauriei)
Lycopodium phyllanthum
Cibotium menziesii.
Ophioglossum pendulum (terrestrial)
Rubus rosaefolius
Carex. Microlepia
Osmanthus common, ally
Psychotria.

n. bound.

Off lava flow, into deeply
weathered soil —
guava brush, with
lower story of Rubus
rosaefolius, a few
widely spaced very tall
lehuas Canthium.
Nephrolepis
a few young Psychotria
Brachypodium sp.
Cordyline (rare)
Wikstroemia
Osteomeles anth. (rare)

---

tall lehua forest but
near road much choked
with guava. in places
very sparse.
Then rough a'a with
sparse lehua.
Then large area of low
dense guava brush with
scattered tall slender lehuas.

Forest becomes denser but still tangled with tall guava. Occ. small kukui.
Then open guava scrub.
205.4 Open lehua with guava and kukui. Then dense lehua forest with some kukui and guava in understory.
Then guava forest with a few, then no, lehua, some lehua and kukui with guava. Then none.
206.9 Rt. stone wall on rt. and rose apple grove.
Pasture invaded by guava.
Then coffee plantations.

Hoofuloa flow 1926.
aa. scattered small lehua. Nephrolepis. Stenocarpa males rock gray.
Guava thicket on rt. coffee on left.
Open tall lehua forest. Considerable guava in undergrowth - tangled. Freycinetia.
Coffee. Cascaring grove on rt. Then patchwork of guava scrub, lehua, coffee. Occ. kukui. Hedychium abundant.

Mixed thickets of guava, kukui, lehua, [illegible] mango, etc. Some areas of tall lehua.
10.5 Open degraded lehua forest with area of pasture. Alelia 1919 aa flow, many small lehuas, Nephrolepis, Gahnia.
Then tall lehua, choked under guava and kukui. Persea occ. Less tangled further on. Then rather open medium lehua on aa. Thick in places some kukui.
Then some open pasture, mostly nephrolepis.
1935 Kahua aa flow, bare except for nephrolepis, thickly near road.
Kipuka visible up hill on right. Some lehua forest killed by lava.
Farms, guava. Fourcroea Vandarius, kukui forming thickets, which are around coffee fields and between farms.
Coffee plantation. Lehua forest above on right.
Then some on left.
Some open lantana scrub on left.

Then irregular pest, guava scrub mosaic
Farms. Fourcroea conspicuous
Lehuea common. Mangos.
11.6 Large Ceiba on right
Dan left pastures on
spectacular Cassytha.
Pastures with Mango trees.
very weedy.
1950 Kaohe aa flow. narrow
tongue. Tephrolepis.
Pastures. Mango trees.
Guava - hedge thickets.
Aiea school.
Open pastures. Guava
thickets. Samanea and
Grevillea trees. Plumeria
above road, just before
Honolua 1950 aa flow. Bare
except Nephrolepis.
Guava thickets.
Cassytha on Lehuea on left.
Kukui.
Guava and Ham. with
Lehuea.
Pasture below rd.
Lehuea thickets above
with Cassytha.
Low open Lehua with
Lantana undergrowth.
Kukui-guava.
Open weedy pastures.
Coffee plantation above
road. Thicket with

Cassytha below.
Thickets both sides.
Kukui above.
~~Pineapple~~ Cemetery.
Farms and pastures.
Mixed thickets.
Hoobena rd.
More thickets. Farms
Albizia lebbek above
road. Leaves from school.
Farms.
Datura arborea on rt.
Farms with breadfruit
trees rather common.
Mangoes
Lehuea. Kukui. Guava thickets
Pastures - papaya plants.
Coffee.
Honaunau road. —
Down it.
Coffee. Mixed thicket
with many. Ore breadfruit.
Guava - Lehuea thickets
Coffee. Thickets. Kukui.
Pastures. Many papayas.
Breadfruit common. Cocoanuts. Pandanus.
Turn down through
weedy pasture with
Melia fairly closely spaced.
Samanea around school.
Pithecellobium - Leucaena
open thicket, getting denser
down-wood. Then more open.

some pasture with Panicum maximum and much Pithecellobium. Oc. Prosopis and Samanea.
Then low scrub and grass on lava - Santalum, Pithecellobium, Lantana, tangled with vine. cœur undetus on left.
Honaunau - Prosopis. - Pithecellobium forest Samanea
City of Refuge. Big trees. Some Cocos at entrance.
Coconut grove with Morinda, Pandanus, Cordyline.
Cyperus laevigatus near pond
Ipomoea pes-caprae
Fimbristylis cymosa.
various weeds. all in courtyard.
Large heiau. Cyperus javanicus under coconuts. Fimbristylis cymosa.

Palvehoe flats in part tufts of Fimbristylis.
Back of this depression of Cyperus jav.

Beyond last wall, on berm above beach, in front of heiau.
Opiuma grat
Ipomoea pes-caprae
Datura meteloides

Cordia subcordata.
Passiflora foetida
Cryptocarya laevigata
Catharanthus roseus
Chenopodium murale
Sida fallax
Waltheria
Euphorbia glomerifera
Leucaena
Morinda

Prosopis is mainly along beach. Back on flats Pithecellobium dominant spreading flattish tops trees to 6 m. & more tall rather open beneath trunks to 25 cm. tbl often several smaller ones from base. Sapling common. some slender Leucaena. Average spacing of larger trees 3.5 m. Ground practically bare.
Photos of heiau. of front of triangle & inside of opiuma forest.

Boerhavia mutabilis comm on rocks near first enclosure, on st. with Emilia javanica + other weeds.

Large Prosopis back of parking area

Leaving by other road.
Cerus in walls. Fishing village.
~~Food~~ Scrub, Ficus sp.
Pithecellobium, Leucaena, Passiflora foetida.
Open slopes or fallow with grass and Nephrolepis.
Low small Samanea scattered here and there, locally abundant. Thin echo or lava flats of Keei Battlefield
On right a low grassy area with scattered Prosopis (?) tree.
Land gets denser and taller, mostly Pithecellobium, on L. higher ground
An field with very little vegetation.
Village with tall dense Prosopis. Many planted trees - Persea, Cocos, Plumeria, Samanea.

Climb up slope through Samanea scrub. Some Opuntia.
Farms, pastures.
Kukui grove ½ mi below.

Main road.
Farms. thickets. Lantana. clumps of Lehua. Coffee.

Mainly coffee plantations Jack tree & Captain Cook. Pongamia and Jacaranda. Some pastures.
Large Datura + Bougainvillea
Pacific main highway
Many houses.
Jacaranda common.
Also Spathodea.
Leadtrees.

March 21 – Nepoopoo Road below Captain Cook, S. Kona

9 1 6 21 3 Caesalpinia sepiaria Roxb. locally common

Mar. 21 – Honaunau, S. Kona

1 22 Cyperus laevigatus L. edge of pond in City of Refuge

Mar. 21 – Manuka Park in thick ~~lobe~~ Metrosideros forest on aa lava flow

2 23 Antidesma hapuae common in understory

2 24 Gouldia terminalis var. ~~the~~ occasional

2 25 Alphitonia ponderosa ? occasional

1 26 Pelea ~~obovatifolia~~ grandifolia (H.B.d.) rare

1 27 Psilotum nudum (L.) common on mossy rocks

1 28 Ophioglossum pendulum var. falcatum rare on fallen log

1 29 Carex brunnea ? rare on mossy rocks

1 30 Polypodium thunbergianum ? rare on mossy rocks

1 31 Gouldia terminalis var. rare

3 32 Peperomia common on mossy rocks

380 ~~400~~ m.

scrambling prickly woody vine; racemes erect, flowers yellow

0 m.

small tree, sterile.

500 m.

slender shrub 3 m. tall, flowers green with ~~top~~ dark purple tube.

– slender small tree; sterile.

St. John & Hume slender sparsely branched shrub 3 m. tall.

(Hosaka) C. Inv.

shrub 1 m. tall; fruit black when ripe.

– leaves subfleshy, green & marked with red beneath.

1961 Hawaiian Is.

March 21 - 1868 Lava flow, east of Waiohinu ~~in road~~ roadside on Pahoehoe lava

41633 Rumex giganteus

March 21 - Wood Valley, Kau Dist. 800 m.
n. of Pahala
~~on lava~~ Metrosideros - Cibotium forest on steep slope

4 34 Dodonaea viscosa
occasional

2 35 "
common at lower edge of

3 36 Pipturus albidus (H. & A.) Gray
common at lower edge of

8 37 Selaginella ~~menziesii~~ arbuscula (Kaulf.) Spring
abundant on floor of forest in ~~areas~~ areas of exposed rock

March 22 - Kahalum Forest Reserve, Hualalai Road 820 m. 2700'

3 38 Vaccinium calycinum Sm.
occasional in tall wet Metrosideros forest.

March 22 - Keauhou, on Hualalai Road, 1060 m. 3500'
in thin ~~tall~~ Metrosideros forest with moss on lava.

2 39 Myrsine sandwicensis
forming an open shrub layer (4 ft. (46)

50 ft

low spreading tree with distorted branches shrub 2-3 m. tall, no bitter almonds da when broken; sterile.

shrub 3 m. tall, leaves greenish white ~~on~~ beneath, veins somewhat reddish, ~~a~~ not on same plant.

sparsely branched erect shrub 3.5 m. tall; fruit scarlet.

shrub 1.5 m. tall.

1961 Haw. Is.

Mar. 22 - Captain Cook to Hualalai
Farms + houses, many ornamentals. Jacaranda very common.
Capt. Cook to Keauhou — coffee plantations - mango trees, bananas, pakaya, persea or Pandanus. Kalanchoe very abundant on banks.
Lehua forest on rt. just at turn up hill.
coffee to 1st gate.
Lehua forest, grove Thicket at first.
Trayonchia
Stand of Touchardia along rd.
Some moss on trunks. Cibotium Pteridium abundant. Broussaisia
Lehua to 125'.
Stops at 2600-2700'.
a Metrosideros. ~~Pogot.~~
c-a Pogot. hawaiensis (second stop)
Perrottetia
Cibotium chan.
Pteridium albidum
Freycinetia arborea.
Cyrtandra
Broussaisia
Peperomia
Antidesma
Alyxia
Hymenophyllum sp.
Thelyp. cyatth.
Elaph. setos.
Trich. hymenianum

The epiphytes are mainly down in the lower few m. of the forest

Psilotum nudum
Vaccinium cal.

Tangles of weeds along rd.

Up about 3000' forest of somewhat lower stature. Pittosporum hosmeri(?) on ledge or flat ground. Less Psychotria here. Less Cyrtandra.

Fraxinus mexicana plantation in large clearing
Top of clearing is Kahaluu forest reserve line. (40" rainfall.)

Much lower lehua 10-15 m. more open Gleichenia.
No epiphytes. Dry. pal.
Cyanea very common.

Experimental clearing 3400'
~~Thin~~ Dense but small lehua with no epiphytes except in lower m. of canopy thin. Thick

ex below

moss carpet on ground
spacing of trees 1-2 m.
Lyc. cernuum abundant.
Machaerina Hed. glomerata
Isachne Styphelia.
Myrsine undue?
Lycopod. venustulum
Nephrolepis exaltata
Sphenomeris
Styphelia Tam.
Thelypt. cyath.
Coprosma sp.
Gahnia gaud.
Nephrolepis cordifolia
Polypod pel.
Rubus sandw.
Alyxia
Peperomia
Liparis
Astelia

Trees very rapidly diminish and open up. Dubautia little moss. Copr. erect.

Becomes open low woodland not over 6 m. tall at about 4250' Boundary.

Styphelia scrub with tiny lobelia trees 2-4 m. Coprosma erect. Dodonaea Vaccinium Dubautia 2 sp.

On a very thin scrub with sparse lobelia.
Rumex sax. 4500-4600
Most only is ~~notorious~~ myrsine
Straccarpus + Sophora
ceased at 4700-4800.

5000' An older soil, deeper, grassy with koa, Sophora, Santalum, Myoporum. badly grazed, many trees dead.
Myrsine.
Open grass. Koa.
Koa-Lobelia savanna
Thin lobelia.
Thin on lapilla soil.
Styphelia-Dodonaea scrub with scattered lobelia.
Sophora, rare.
Verbascum abundant
5500' Santalum on lapilli soil in loose Styphelia scrub with mamani. a few lobelia, some rain locally
Coprosma rare. C. erect.
Myrsine
Juncus Pollaea.
Cyperus
Carex ~~macrocarpa~~
Dianella
Wikstroemia
Osteomeles

scrub more luxuriant
really open scrub front,
on cones.
Rapilli beds. scrub very
mixed.

6500' rapilli ash on pahoehoe
spectacular lava balls
laminated from rolling.
Lava in river a gorge
with rolled sides. Arbus
in place. Lebus.
Styphelia luxuriant
in them. Stenogyne.
Scrub on ash very sparse
with scattered lebus.
Cone nearby - Kamakou
very sparsely vegetated.
Those on ahead less so.

Brown ash. partly covered
by brown fine lapilla ash.

Lava cones, lined by spatter
ramparts.
Styphelia
Coprosma mont
Rodonea
Dubautia
Vaccinium
Pellaea
Vacc. ret.
Geranium
Deschampsia

2a Epilobium
c Coprosma ernod.
c Galinsia
r Asplc nivosa
r Asplenium lucunnare
c Polypod. pel.
r Polypod. thunb.
r Lobaria sp.
r Gesteria nigrans
r Tetramolopium

Low open to sparse scrub, denser
at in ravines and in cones.

Up hill scrub is much
more dense

"Vernal" pool with
Veronica fine yellow soil
bot. as fragment.

7600' oasis of Metrosideros
Lophira etc.

Tagetes minuta Cirsium
Conyza bon.
Hypochaeris
Geranium
Epilobium
Verbascum

Pteridium
Trisetum
Tetramolopium abundant

Top saddle sparse
Styphelia scrub. Dodonea
Little lehua.
Fanded pahochoi
Curious ad rampart

Drying to Sophora prost.
on grassy lava slope.
Many planted Eucalyptus

Small cone with
well def. crater.
Epilobium
Verbascum graphalium
Hypochaeris rad.
Erythraea
Verbena bonariensis
Rumex acetosella
Holcus? Tagetes minuta
Asplenium trichomanes
abundant:
Ptaydium
Sophora
Dodonaea
Pellaea
Deschampsia
Triactum
Luzula
Styphelia

saddle
basalt
cones
beautiful
view
Kaupulehu
Kohala
mountains
6000'

Lava flow - aa - on way
down. scrub. scattered
mamani + lehua.

Slope down is scrub
gradually increasing in
ht. to 2-3 m. down & edge
of cone. Scattered Sophora,
Dod. ads any lehua.
Stately lehua again as cone
are approached. Side of them
toward Hualalai rather
barren, sparse scrub.
On sea side more moist
open low lehua forest.
Trees on ground. every
below in scrub with
scattered lehua.
Asplenium dimorphum acc.
Cyrtos. simplicifolius abundant
Pit crater about 300' across
and deep.
Veg. of Cyanea, Pipturus,
Ilex?, Labordia, Pteropteris
palacea and a very long-leafed
Dubautia

Around this - open scrub
with some lehua. Geranium
Close to Kapulehua 1 veg. sta.

Telephone Station
Kapulehu. +500' ± /
Xenolith exposure.
Collapse pit with great
mass of Xenolithic nodules
crusted over with 10-15
cm. Pahoehoe

Grassland of Pennisetum
on pahoehoe flow.
Ae bare in places except
for scattered Lehua.

Grassy slope on older lava
just above highway
scattered dry forest trees
Chm. oahuense. Dracaena.
05.2 at Kanpulehu
some Grevillea.

Road to Kona - savanna
of Pennisetum with
Grevillea + some native trees,
Sophora, etc.
Uncultivated land
mostly Grevillea, some
pasture. Pennisetum local.
Melinis.
Lava on coastal flats
black - flows very
striking.

small farms. guava
brush. thickets. occ.
kukui, mango.
70.8 Coffee orchard.
guava brush. Pastures.
71.1 Holualoa Rd.
Coffee and farms. thickets.
mixed thickets for some
distance.
More farms
73.1 Road to left.
low mixed scrub below.
Lehuna with the sisal.
Scrub dries a little.
Then the Prosopis with some
kiawe and some Leucaena.
75.2 Kailua - airport - volcano jct.
Large barren, to left.
beyond on beach road -
Prosopis, Leucaena.
Beach houses.
Leucaena with Prosopis.
Arid coast. Some good
Prosopis forest on left.
Much Leucaena scrub.
Coconut groves at Kahalua Park.
Prosopis - savanna - Pithecellobium
- Lava flow - aa - bottom of
81.7 experimental farm. Keahou
Switchback on flow.
Cattle ranch on Kona.
Leucaena - thickets on ag
farms. + thickets. Kalambet
84.4 Main rd. Thickets + farms.
85.1 mixed scrub. Reforestation on rt

Alexandra Palm - Olaa

For Waihis trip - start early as fog comes in after noon.
Follow ditch trail around heads of valleys
Come out at Puu Alaa where cars can get into edge of forest on Water authority Road.

State dev. Forestry 5 jeeps
S.C.S. several jeeps
Bishop Estate. 2 jeeps
Northup Castle 1 "

---

ctd. Open patchy lehua with Lantana, etc. farms.

95,9 Kaalaloa Rd.
Much coffee.
Open lehua.
Farms & coffee

Temple on rt. Buddist. Kailalua

left Macaranga mappa

Bligia sapida on rt. just before hospital. Kealakahua.

summary of Hualalai Rd.
Up Keauhou 1, through coffee on lower slopes. into Kahalua Forest Reserve, into wet forest of magnificent lehua, to 40 m. with second story of Psychotria hawaiiensis 20-25 m. much wet undergrowth.
This more or less the same to big clearing, perhaps somewhat lower stature toward clearing.
Top of clearing, at 3400', lehua forest resumes, but becomes lower. On upper road it is lower, less epiphytes. To second clearing. 3500'? Here forest is much lower, dense but with very open canopy because crowns are so narrow. Epiphytes all non vascular. Epiphytes only on basal 1 m. a lack of trunks, crustose lichens farther up. The ground has a thick moss layer, mostly Hypnodium cenmium and other pteridophytes. Thick layer of Myrsine. Tracheo dictiophyllo common.
Above this the forest rapidly diminished in height and

became more open, less mossy, with Coprosma ernodeoides and Dubautia. at 4260', the upper boundary of Keauhou, it has become a low open woodland not over 6 m. tall. By 4500' it has become a Styphelia-Dodonaea-Vaccinium scrub with scattered 2-4 m. Lebua. At 4550-4600 the road goes over an aa flow with very thin scrub and very sparse lebua. Exocarpos, Myrsine, Sophora at 4700-4900' but very rare.

At about 5000' the road comes out on the edge of a broad flat area of an older deeper soil - grassy with bora, Santalum pilgeri, Myoporum, Myrsine, etc badly grazed. - then open grass, then bora-lebua savanna, then sparse lebua. The soil from here is of yellow-brown lapilli somewhat larger than pea size. Up slopes of Styphelia-Dodonaea scrub with scattered lebua, Sophora, Myoporum. Verbascum thapsus is very abundant.

This becomes looser and lower, Sophora a bit more common

Santalum pilgeri?, occasional, Coprosma ernodeoides.

Then up hill on lapilla beds. On such cones as the one east of Kaumuohu, the scrub becomes more luxuriant, really fine scrub forest. On lapilla beds a very mixed scrub. At 6500' south of Kaumuohu, on left of rd. spectacular rolled lava "snowballs" and a "lava river" a manoa, a gorge, becoming a tube in places. In this luxuriant vegetation of Styphelia and some lebua.

Cones, beginning with Kaulumuohu, less and less vegetated, rather barren.

Then a brown aa flow partially buried with brown fine lapilli.

At about 7150', n. w. of Poikahi, in open scrub in a manoa lined by spatter ramparts, a scrub 1-1.5 m. tall, mixed Geranium cuneatum small plants rare in other bushes.

An open to somewhat dense, low to tall scrub covers the passes and cones in the area from here to highest

saddle at just under 7000' on Pua Hualalai, n.e. of Hauna crater.

On the west slope there are a very few lehuas, mostly a grassy lava slope with an open, but dying dryland forest. Much planted Eucalyptus to take its place, not very large.

At about 7500' a small cone bare very little vegetation. The general aspect above this is sparse scrub, with almost nothing on a ponded lava flow at 7200'.

On the west slope between 7500' and 6000' the scrub remains about the same except to increase in stature till it is about 2½m. tall, down to a cluster of small cones above the Kaupulehu flow. These, on the east side, are rather barren, on west side a low but rather dense lehua forest. This at about 5700-6000'. At about 5500' the vegetation is an open scrub, especially of Styphelia with some scattered lehuas. A thick soft moss layer on ground, Lycopodium and. Pit crater.

From here down the road follows the Kaupulehu aa flow, with sparse fairly large lehua, the only understory growth of patches of Nephrolepis. Very rough. This extends down to just above the Telephone relay station, which is on grassy to bare pahoehoe. Xenolith station.

Below this a grassland of Pennisetum on pahoehoe flow. Crosses a band aa flow into more grassland with scattered planted grevillea and dry forest trees.

(ctd. from p. 148)

1961 Hawaiian Is.

41640 Selaginella arbuscula (Kaulf.) Spring.
common in dead moss

same
in open metrosideros forest

4 41 Myrsine
rare

March 21 - Keauhou no. 2,
on Hualalai Rd.

2 42 Rumex giganteus f. cremanthodes
rare on aa lava flow
in very sparse vegetation

5 43 Exocarpus gaudichaudii A. DC. (s.str.)
occasional

March 22 - Flats southeast of
Waha Pele, Keauhou no. 2

4 2 44 Santalum ellipticum var. pilgeri
common locally in savanna

March 22 Between Waha Pele and
Puu Ihaaha,
in tall scrub

45 Santalum ellipticum var. pilgeri
4 occasional

March 22 Southeast of Waha Pele
Keauhou no 2.

4164 46 Dodonaea viscosa
occasional in open scrub

erect, somewhat scrubby.

1320 m
4000'

1400 m
4600'

erect shrub, 2 m. tall,
flowers and especially fruiting calyces scarlet.
low broom-like shrub, young tips maroon; fruiting receptacle globose, yellow, fruit maroon.

1450 m
4750

1800 m
5900'

spreading tree 4 m. tall,
leaves rather glossy, dull yellowish green; flowers greenish, fragrant.

1620 m
5300'

shrub 3 m. tall, leaves dull yellowish green

1550 m
5100'

spreading tree 4 m. tall.

41647 Myrsine
1 common, forming grove
40 ~~scrub~~, Myrsine
~~scrub~~ occasional in open flat

tree 12 m. tall, with new leaves.
tree 8 m. tall. fruit black.

March 22 – between Waha Pele and Puu Ikaaka — 5300' — 1620 m.

4 49 Santalum ellipticum var. pilgeri occasional in tall scrub — shrub 2.5 m. high, leaves stiff yellow-green, fruit immature
3 50 Coprosma montana HBd. var. montana occasional in tall scrub — (broad-leafed form) — shrub 1.5 m. tall, ♂.

Mar. 22 – ~~between Puu Makaala and Puu Ikaaka~~ S.E. of Kamamuku — 6300' — 1920 m.

3 51 Santalum ellipticum var. pilgeri occasional in scrub on lapilli ash. — shrub 2 m. tall, leaves dark dull purplish green when old, light green when young; flowers green, fragrant — tyke Coll.

2 52 Rumex giganteus ~~of~~ occasional in scrub on lapilli ash — shrub 1 m. tall fruiting calyx red; flowers red with white style.

~~3 53 Coprosma montana HBd. var. occasional in scrub~~
~~4 54 Wikstroemia occasional in scrub~~
~~3 55 Santalum ellipticum var. pilgeri occasional in low scrub~~

~~3 56 Exocarpus gaudichaudii A. DC. (? sti.) occasional in scrub~~
(nest ? at top, dots others)

3 53 Coprosma montana HBd. var. occasional in scrub — montana (broad leafed form) — stiff shrub 2 m. tall, fruit orange, juicy.
4 54 Wikstroemia occasional in scrub — low compact shrub, 1 m. tall, flowers yellow
3 55 Santalum ellipticum var. pilgeri occasional in low scrub — shrub 0.4 m. tall, flowers yellow-green, fragrant, fruit black, juicy when ripe.

3 56 Exocarpus gaudichaudii A. DC. (? sti.) occasional in scrub — low bush 0.6 m. tall, spreading, tips maroon; fruit red, receptacle yellow. — a separate form

4 57 Cyperus hillebrandii Boeckl. L. s. occasional on bare ground in open scrub

1961 Hawaiian Is.

Hawaii, North Kona, Hualalai

10,000+

6500'

May 22 - just south of Kaumana
in open scrub on ash

41658 Tetramolopium
rare

tiny tufts.

59 Stenogyne
rare in small lava
ravine tangled in small
metrosideros shrub

tangled herbaceous vine;
flowers bronze-brown.

7,000+

7100'

March 22 - Pass nrs. of Poiwahi
in scrub in shallow ravine

60 Tetramolopium
rare

61 Trisetum glomeratum (Kunth) Trin.
rare

62 Lycopodium Hawaiiense Bush.
occasional

63 (grass) Sporobolus africanus (Poir.) Robyns
common

tussocks

64 Geranium cuneatum var. cuneatum
very local, in stiff shrubs
where goats can't reach it.

dwarf shrub, sterile;
leaves consistently green
on both sides.

65 Asplenium trichomanes
occasional in crevices in lava

66 Asplenium adiantum-nigrum L.
rare in crevices

67 Veronica serpyllifolia L.
local, in desiccating pool.

flowers bluish white.

8000+

8150'

March 22 - East Hualalai,
below summit
on spatter cinders

68 Pteris
rare in small Myoporum grove, grazed

41669 Conyza bonariensis (L.) Cronq.
rare on open lava slope

1 70 Geranium carolinianum ssp. australe (Bertth.) Fosb. prostrate.
rare on open grayed lava slope

4 71 Tagetes
common on grayed ravine walls

3 72 Myoporum sandwicense
small grove on high slope

1 73 Helichrysum
rare in head of ravine

1 74 Myoporum sandwicense
small grove on high slope

1 75 Veronica plebeja R. Br.
rare on grayed slope

March 22 - Flat east of Pun Hualalai

2 76 Veronica scapelliformis L
locally abundant in desiccated pot

Mar. 22 - saddle north of highest point of Pun Hualalai

1 77 Styphelia douglasii
abundant

March 22 - small cone north of sheep station, Kaupulehu

1 78 Gnaphalium japonicum
rare on bare soil.

Mar. 22 - Cones at head of Kaupulehu Lava Flow

1 79 Geranium cuneatum var cuneatum
rare in scrub

1 1074a Metrosideros collina ssp. rare in high slope

7160'

prostrate.
erect rays white, odor very strong;
spreading low tree 4 m. tall,
flowers rose purple, very fragrant.

shrub 3 m. tall;
flowers white, fragrant
prostrate.

7850'

prostrate, fls. bluish white.

6100'

stiff shrub 1 m. tall,
flowers white

5500'

shrub 0.3 dm tall, petals white.

March 22 – above def pit crater at head of Kaupulehu lava flow in mossy ground in open scrub on gentle slope

4|6	80	Centaurium umbellatum Gilldo. common	flowers pink
1	81	Sophronia communis occasional	flowers yellow.
1	82	Cerastium occasional	flowers white.
1	83	Plantago virginiana occasional	
2	84	Stenogyne rare in semi shade	low arching stems, rhizome thick, white; flowers dark purple
4	85	Lycopodium cernuum common	roots yellow, acrid to taste; flowers yellow.

March 22 – Telephone Relay Station, Kaupulehu on ? open pahoehoe lava

4	86	Peperomia plentiful **	clumps, growing from thick fleshy, horizontal rhizome; leaves fleshy.
1	87	Senecio sylvaticus (vulgaris?) very local	
1	88	Galinsoga ciliata (parviflora Cav.) occasional	
7	89	Plectranthus australis R. Br. common	flowers vary from very pale lavender to almost blue.
1	90	Sherardia arvensis on crushed lava parking lot	prostrate

March 22 – slope below Telephone Relay Station, Kaupulehu

1	91	Euphorbia peplus L. locally abundant	erect, lowerparts red.

5130'

7600'

March 23 + Kona to Waimea

56.9 Jct. of upper + lower road.
Guava brush, small clearings.
Melinis on road banks and cut.
Mango, Persea, kukui etc.
farms.
Guava brush and pastures.
Views of coastal lava flats
to left. Kukui on rt.

61.1 Plantings of Grevillea robusta.

62.0 kukui grove. More Grevillea
and Eucalyptus.

62.5 Pennisetum grasslands with
scattered grevillea.

63.8-4 View of extensive lava flows
on left.

64.4 Kapulehu forest reserve.
Then Kanpulehu aa flow.

65.5 Grassland with native trees
between 2 aa flows.
Several hapukus. with
Nothocnidium sandwicense
and other dry forest trees.
in Pennisetum.

66.7 Fair dry woodland on
both sides of road. - varying
from savanna to open forest.
even closed in places.

68.6 Forest ends. A thinly grassy aa
flow.

69.1 More dry forest.
Puu Waa Waa in distance rt.

70.2 Cactus occasional. Good
dry forest and savanna

70.7 photos of dry forest.
Lantana occasional.
Some Grevillea scattered
in it also jacaranda

71.9 Forest ends. pasture begins.

72.4 planted Grevillea, much
Opuntia, Melia, some
Jacaranda.

73.5 Then scattered dry forest trees
then an aa flow. with
little vegetation ex Pennisetum

74.1 Open dry forest and grass
on old aa flow. Much of
this is kiawe.
View of Mauna Kea ahead.
Kohala Mt. to left.

76.7 Some lantana mixed with
dry open forest and savanna.
The grass through this
region is almost all Pennisetum

77.8 Forest much lower.

78.3 Forest essentially ends.
Grass with abundant
Opuntia, scattered kiawe.
Then another area of
Kiawe. Lantana. Dodonaea, etc.
with opuntia.

79.5 gate. Land with cactus on
rt. grass with cactus on left
Eucalyptus planted on rt.

80.8 overgrazed pasture with
Opuntia.
Planting of Eucalyptus.
More pasture.

82.0 Mauna Kea to rt. in distance. Open pasture with scattered Opuntia. patches of Dodonaea scrub.

82.5 Eucalyptus on rt. pasture on left with brow scrub of Dodonaea. Dodonaea also in Eucalyptus.

83.5 Dodonaea scrub with some grass. over large area. Scattered Opuntia. Some Sida fallax.

85.9 Some grassy areas, esp. below road. Pennisetum lacking here. Badly overgrazed.

87.1 Jct. with Saddle Rd. Rt. 20. Some patches of scrub still, esp. above road. Mostly thin overgrazed grass. Considerable Opuntia.
Vast level expanse of pasture
Argemone. Sida.

Much Eucalyptus planted around Waimea.
Fields and green pastures. Eucalyptus and Monterey Cypress wind breaks. Honey factory on rt.

Into pasture thru gate. Kikuyu pasture. Ravines with Rhus tax. etc on sides. Past reservoir thru gate. Native forest on rt. but with Araucaria, Eucalypt planted on edges. Cryptomeria alnus.

Sadleria, Sphenomeris on steep slope in pasture. Hoorbolus al. dominant in pasture.
Ravine on left with Cibotium forest.
Enter forest gate
Planted forest. some native things. Cibotium. Opening with Glenchenia. Rush. Sadleria. Much Endotaenium sp. Indigofera and ~~rock~~ of Cibotium, Chaerodendron, Cibotium Sadleria, etc.
Eucalyptus along pipe. Low vegetation continues with less disturbed appearance to edge of Waipio Pali. Then even lower and more depressed and windswept vegetation along edge to end of road. Sphagnum along road.
At end of road small clearing for turning cars
This is lined with Sadleria hillebrandii, Cibotium cf. glaucum tall shrubs with trembling leaves Chaerodendron.
On left side (facing Waipio) Gonocalyx terminalis v. purpureus Broussaisia arguta Hedyosmum, Vaccinium calycinum, Myrsine sp.

and Metrosideros. Acer cand. along edge of road.

On other side small Sphagnum bog, much Saddleria + Cibotium, very depressed. Most of same shrubs. Machaerina angustifolia.

Clearing weedy.

Across ditch at head of valley on edge Dicranopteris sp. Gleichenia, Dubautia sp. plantaginea, Stenogyne, Clermontia sp., Cyrtand. Just to left a trail - Gunnera petaloidea - common down over path.

Along trail to left - Hypericum japonicum. Asplenium sp. 15 m along. Cyanea sp. overhead on bank. Pteris quadriaurita creeping on mossy bank.

Sphagnum line banks of small watercourse. Cladonia on rocks. Vaccinia phlebaja on rocks and banks.

Patch of Hedyotis sp.

Boggy low scrub away from ditch - low Metrosideros
Cibotium sp. glaucum. ✓
Athyrium sp. pectinatum ✓
Carex sp. sandvicensis ✓
Elaphoglossum gayanum ✓
Saddleria bullebrandii ✓
Peperomia sp. ✓
Nertera ✓
Hymenophyllum recurvum ✓
Thelypteris ✓
Lycopodium cernuum ✓
Agrostis sp. ✓
Vaccinium cal. ✓
Pelea sp. clusiaefolia ✓
Hypericum ✓
Cuscuta sp. ✓
Machaerina angust. ✓
Alyxia ✓
Juncus bulb. ✓
Cheirodendron ✓
Vaccinium ✓
Coming road -
Ilex anomala on r.
Cheirodendron
Gaultheria
Machaerina scandens.
Open sphagnum bog
Dicranopteris - Carex
Trematolobelia - Cyrt.
Gaultheria (rare) - Broussaisia
Coprosma dietrichophylla
Machaerina angust.

Edge of dell
Gaultheria hirtella
Rhododendron
Cibotium
Myrsine urvillei
Myrsine lessertiana
Olearia furfuracea
Cyathea
Metrosideros
Cheirodendron
Coprosma
Lobelia
Cibotium
Hedycarya
Athyrium
Pteris dura
Clermontia
Dubautia
Vaccinium
Gaultheria
Rubus sandwicensis

Between 2 small bridges can be seen a bog or a natural clearing
Trail along ditch from 2 bridges -
Cibotium menziesii
Clermontia
Rubus

The low vegetation, in general, is dominated by Metrosideros, but with abundant emergents of Cheirodendron. Rhex [illegible]

General height 1 - 1.5 m.
Emergent to 2.5
Pig rooting everywhere.

Ravine - taller veg.

Forest taller every where
pali.

02.7 On way back -
stunt in open country well
south of Saddle Road Jct.
is about 80% Dodonaea
20% Wikstroemia with
a little Sida fallax.
Trichloaena rosea
fine yellow-red ash soil,
but rather thin.
0.6 - 1 m. tall. a few
other weeds Pennisetum
Verbena bon. Opuntia, etc.
Waltheria, none numerically
important.

11.0 well developed dry forest.

Most of the dry forest here
seems a mixture of Metrosideros
and Diospyros.

13.4 Reynoldsia (wanakai)
13.9 " (manka)
16.6 Dracaena (manai)
17.7 Erythrina, etc. (manai)

18.4 many Reynoldsia
18.7 interesting front
- 19.0
20.1 Nythrotrichum
20.9-30.0 "
22± a a flow.
lava river with spatter ramparts.
27.6-9. rock front Nothrotrichum, Santalum
29.7 1801 flow.

Sambucus around many of houses in brown. Medicinal?

30.0 Jct. Honuloa - Kailua rd.

33.3 Reynoldsia in sheltered area mauka.
33.9 Jct. with Volcano Rd above Railroad.

Thick to open Prosopis forest.
Locally Leucaena with Prosopis.
and locally with Samanea.

1961 Hawaiian Is.

Mar. 23 - Waimea-Kona Road
opposite Puu Waawaa

41692 Santalum ellipticum var. pilgeri
4 Dry open forest on aa lava

Mar. 23 - head of Alakahi gorge
Kohala Mts.
in low shrubby vegetation
near edge of cliff

2 93 Myrsine sandwicensis
common

2 94 Pelea clusiaefolia A. Gray subsp. cookeana (Rock) Stone
occasional

~~95 Lobelia~~

4 95 Gouldia hillebrandii var.
occasional

2 96 Coprosma pubens Gray
occasional

4 97 Gouldia terminalis var. purpurea Fosb.
common

~~1 98 Pleomele aurantiaca (Lindl.) Hook. f.~~
~~occasional~~

~~99 Dubautia sp.~~

3 98 Stenogyne
occasional

4 99 Pipturus albidus (H. & A.) Gray var.
common

4 1700 Cyanea
3 occasional

1 01 Clermontia
rare

650 m.

shrub 2 m. tall, leaves yellow-green, glossy above, flowers green, yellowish within, fragrant.

1130 m.

shrub 1.5 m. tall; fruit black.

shrub 1.5 m. tall, bud green.
♀

shrub 2 m. tall, flowers green, ripe fruit black.

shrub 2 m. tall; flowers greenish.

— shrub 2 m. tall.

woody scrambling vine; flowers curved, deep purple.

— shrub 1.5 m. tall; leaves stiff, rugose, main nerves red beneath.

— shrub 1.2 m. tall, flower buds purple; fruit orange, soft.

Eastern shrub 1.3 m. tall, petals and sepals black-maroon

1961 Hawaiian Is.

same - on moist earth cut above ditch

4 1702 (grass) Deschampsia nubigena Hbd. o.l.
2 abundant

1 03 Cyperus [illegible] Hypolytrum clypeos Nees
common

1 04 Nertera granadensis v. insularis
occasional

same - in low boggy vegetation on flats back from cliff edge.

4 05 Carex
abundant

2 06 Clermontia
~~shrub~~ rare

4 07 Cheirodendron trigynum (Gaud.) H. Ll.
very common

4 09 Vaccinium calycinum var.?
common

2 09 Athyrium microphyllum (Sw.) Alston
common H.St. J. Robinson 8/96

1 10 Thelypteris
rare

same - in Sphagnum bog

1 11 Lobelia hypoleuca
rare

1 12 Lobelia
rare

~~4 13 Cheirodendron
very broad~~

7 13 Sphagnum
abundant

Shrubby. prostrate, closely clinging to earth; fruit orange.

~~shrub~~ tufts of a number of stems.
lactiferous shrub 1.5 m. tall,
corolla & calyx bluish
maroon within.

Shr. — shrub ~~3~~ 3 m. tall,
aromatic; fruits maroon.
— shrub 1 m. tall; leaves
somewhat glaucous beneath;
fruit red when ripe, glossy.
rhizome erect.
Buds translucent

lactiferous shrub, sparsely branched,
sterile.
— dead fruiting plant.

~~tufted~~

forming deep pale green cushion.

4/7/14 (grass) Deschampsia nubigena Hbd. & S.f.
3. abundant

same - in eroded boggy slope where clay is exposed

4 15 Eleocharis obtusa (Willd.) Schultes — tufted
very local

6 16 ~~fuegata~~ Juncus planifolius R. Br. — tufted
common.

2 17 Juncus bufonius — small tufts.
occasional

Mar. 23 - 2 mi. s. of junction of Waimea-Kona Road with Saddle Road — 800 m.
in low scrub in overgrazed pasture

4 18 Sida — shrubs 0.3 - 0.4 m. tall.
common

3 19 Wikstroemia — shrub 0.7 m. tall; fruited.
very common

3 20 Dodonaea viscosa — shrub 0.8 m. tall.
abundant, dominant

3 21 Wikstroemia — shrub 0.5 m. tall, fruiting abundantly, fruit red, globose. (only a few plants with abundant fruit).
very common

3 22 Dodonaea viscosa — shrub 0.9 m. tall.
abundant, dominant

March 24 – Kealebahua
Sambucus is generally planted around small houses, just as in Colombia, etc.

Mar. 24 – Kailua – Hilo via saddle.
60.1 ~~Kailua – Honaka~~. Kamuela – airport jct
ornamentals.
Kiawe – thin thickets, with Leucaena, on gentle lower flow slopes. Savanna cerrosa in upper part.
61.7 Old sisal plantation (Roystonea tree mamba at about 62.) to 62.7
Fauna: guava thickets, coffee, etc.
63.7 breadfruit trees on left.
64.0 jct. with upper rd.
66.1 Balsa tree on rt a bit away from rd.
67.7 Black lava flows down flats to left.
68.3 Grevillea planting.
71.7 Kapuleha Forest Reserve Gate.
Thicket of Nothotrachium sandwicense just below road. with trees of Diospyros ferrea around ~~the~~ it.
Brighter green, small leaf. trees are Canthium.
Slightly to right and 10–15 m. below road a tree of Kokia.
Just above road, inside gate, Chenopodium album ssp. 2.5 m.
To left, just inside gate, Santalum. Just above this a sizeable bush of Osteomeles 2.5 m
Chenopodium general in

undergrowth. Cyperus trachypanthos and a narrow-lfd. form of Cocculus, in grass here. grass is pennisetum.
Straight up slope on left a tree of Colubrina oppositifolia, with a slender one of Nothocestrum and one of Santalum.
Lida pallax shrub.
Much Diospyros.
Ort. a fine Colubrina and around a boulder in center Canavalia galeata.
Red mint is Salvia coc.
Small blue one Plectranthus
Peperomia sp. with it on lave rocks.
Santalum common.
Above left hand Santalum another Nothocestrum
Circling to left we find slender Sapium and a large tree of Pouteria sp. above it Canthium.
a thicket of Lida.
Tree of Diospyros parasitized by Korthalsella
Asplenium trichomanes on rocks. Sicyos sp on rocks in open spots.
Kalanchoe planted.
2 forms of Cocculus one with emarginate petals.

weeds
Solanum nigrum
Physalis peruviana
Datura fastuosa
Lantana camara
~~Cucurbit~~
Euphorbia pekus
Salvia coccinea
Pennisetum rupellii
Asclepias alba acu
~~Solanum capsicastrum~~ balsamina
Momordica charantia
Stellaria media
Cupressus sp (planted)
Ophiuseus sp.
Emilia javanica
Conyza bonariensis
Grass just below fence
Kobria
Dracaena arb.
Osmanthus sandw.
Pellaea
Nephrolepis exaltata
Argemone glauca sp. (smooth bud)
Photos of Kobria and roll 7, print
9 no 9 (not 2 overexp.?)
Photos of general aspects,
of Argemone. more of gen aspect.

Lower st. corner
Xylosma hawk.?
Liparis laeta
Thunbergia indica
Hibiscadelphus hualalaiensis planted

Below rd. green trees some with pendulous brs. Xylosma
Tall brownish one Pouteria
lower greenish, brown ones,
Colubrina.
Plumbago zeylanica beneath
also a Dracaena.

Lantana abundant but
in bad shape.

25.0 Erythrina grove mauka
with abundant Erythrina
also Psidium, Canthium,
Lophira, Myrsporum.
some Nothocestrum
Dracaena Nototrichium,
1 Reynoldsia tree + 100 m.
mauka
Cattle have been
doing considerable damage.
No seedlings a very young
trees.
Photos of Erythrina
and general aspect. finish
roll 7.

73.6 grove of Reynoldsia mauka.
79.0 photos of Pua Wea Waa + in
other directions - dry forest.
79.3 Pua ea tree below
81.1 1859 flow.
then a good patch of
open dry forest. largely

Metrosideros and Dicranopteris but some other native species. Stature gets lower northward to just beyond Pun (at 85.0) where it fades
85.8 out into grassland and Dodonaea scrub. Last tree are Sophora.
87.8 Cross section of cinder cone on rt.

94.2 Jct Saddle Rd.
Bare cinder cone to rt.
Mainly Dodonaea scrub some Opuntia, some open grass with more & less Opuntia. Patchy, more scrub than grass lower down, grass increasing upward.
97.7 Patches of scrub rather sparse
98 Eucalyptus planting on left, to 98.9. Then grass. Is more scrub. Pasture of Sporobolus elongatus.
99.4 Patch of Eucalyptus on rt.
Patch of Cupressus macrocarpa
400.2 and rows of Eucalyptus
Acacia dealbata, Cupressus,
00.3-.8 Eucalyptus etc. Ranch bldgs left. (Waikii)
Windbreaks of Eucalyptus.
Pasture land.
02.3 Old cone with crater to rt. (Cone)
2.9 Remnant of Sophora forest & left.
3.4 More scattered Sophora
4.2 Myoporum + some Sophora, scattered

ash in watercourse. a little Dodonaea.
4.8 Wooded cone to left, some bare ones ahead.
Mauna Loa ahead, Hualalai to rt.
5.2 Mauna Kea to left.
Training area. (Pukakuloa) grass much more luxuriant, more Dodonaea. A little Sophora and Myoporum.
6.2 Chenopodium common. Land badly torn up by heavy military equipment.
7.2 Cones on Mauna Kea slope to left fairly well wooded. Here scraggy veg. of Chenopodium, Myoporum, Sophora, Dodonaea scattered in grassland.
Cones in all directions.
09.2 (39 mi. to Hilo) Pun Kohe
Chenopodium scrub, open, badly beaten up.
10.0 Pumice & ash.
A definite belt of scrub part way up Mauna Kea on left. Grassy slope below, bare (or grassy) above.
belt is about 1/4 or 1/3 the width of slope, but becomes broader ahead until it reaches down to level of saddle at military camp.

11.7 Pohebulwa airy camp.
above this open Sophora
Myoporum woodland with
~~scrub~~ Chenopodium and
tussock grass.
13.7 Hunting Lodge and picnic
ground.
Woodland horribly beaten
up by manoeuvering.
14.3 Base ca or right, thin
on left that on left & ~~other~~,
covered by scattered toobies
and Myoporum with Chenopd.
15.4 Now ca level (1943) No vegetation.
Immediately to left some fair
Sophora - Myoporum forest.
16.9 Good Sophora - Myoporum
-18.6 Forest just to left across ca.
17.9-~~18.6~~ 19.6 ~~7.11=8~~ Pahoehoe flow on rt. across ca.
18.9 Hill with Myoporum - toobies
on left, poor condition.
19.0 highest point - ca field.
19.7 Badly damaged Sophora Myo. forest
to left.
19.9 Pahoehoe field.
21.0 Humuula Sheep Stn. on left,
Puu Hulehule on rt.
Forest on Puu Hulehule badly
damaged by grazing.
Myoporum
Coprosma
Sophora
Acacia koa
Styphelia
Rubus macraei
Melrosideros Rodmea

plateau of Pahoehoe + of mauna kea

The grassy veg. is completely
weeds:
Rumex acetosella
Cerastium vulgatum
Festuca myuros
Bromus rigidus
Geranium cantianum
Poa compressa
Bromus sp.
Sonchus oleraceus a cf. arvensis
Stellaria media
Pteridium
Lapsana
Taraxacum vulgare
Hypochaeris radicata
Bidens pilosa var.
~~Ludwigia palustris~~
Epilobium.
Bromus catharticus a weed
Physalis peruv.
Hypochaeris glabra
Lepidium virginicum
Anthoxanthum odoratum
Side toward Mauna Kea
grassy with a few Myoporum
Sophora Coprosma. To also.
Other side has forest with
much Coprosma, a little
koa, some Myoporum a few
bushes Styphelia (tall) and patches
of Rubus macer.
around base a bit of
Styphelia scrub. + Coprosma
Bryum argenteum on
cinders along rd.

some cinders covered with of mk side

19 200

Pahoehoe flat toward Hil.
21.9 aa on rt side with
less lehua woodland.
22.4 Fresh aa field.
Complicated pattern of
aa, pahoehoe, and old
flows with low scrub.
on flat in saddle.
Degraded forest to left,
grazed.
Fresh flows along rd.
for some distance. Also
24.1 many small kipukas
with small lehua and
low scrub & dwarf scrub.
24.7 Lichens abundant on
aa flows.
25.8 Pahoehoe with lichens & ferns.
Then more aa with lichens.
17-9-1
26.5 Dwarf scrub on left.
Lehua forest across flows rt.
27.5 lehua forest on left.
More and more veg. on aa
lichens very thick. Sadleria,
Cyrtom. emod. Polypod. fil.
lehua (small) Vaccinium.
30.0 (19 mi Hilo) Small lehua, 1-2 m.
common. ferns more and
more abundant.
30.6 Low open forest
30.7 Patch of taller forest on rt.
More and more tall forest.
Low forest more and more
developed.
31.0 Gleichenia. Tall forest on rt.

33.0 Mosaic of low open and
tall, rather dense forest.
33.5 Open low forest with
gleichenia & sadleria
This for some miles.
35.0 stop. Open scrub & forest
of lehua 2-4 m. tall, with
gleichenia, hypodium cervinum,
Machaerina angustifolia.
Coprosma spp.! Styphelia (a)
Leptecophylla cont. (in trail) Vaccinium sp.?
Coprosma ernod.; cyperus compressus!
In places the Machaerina (in trail)
is dominant in ground layer
in place Gleichenia.
Hedyotis glomerata
Sadleria cyatheoides
Dubautia scabra (?)
Hypochaeris radicata (in trail)
On rough pahoehoe. Covers
ground completely.
(14.2 mi. above Hilo) Small
back off place on rt. & trail
into wood.
Taller forest on left:)
37. Tall dense lehua forest with
well developed subtierra large on left.
Then lower, tangled with
gleichenia.
37.6 Open fern-Machaerina with
scattered lehua. Andropogon along rd.
Thickens up & farther down. Some koa.

send booklet

Dwight E. Walker
Paloa, Hawaii

Harland A. Arabi
Pentax

41.0 = cleared & regrowth.
patches of bush. patches of
bare lehua. mostly open
degraded forest or open scrub.
42.1 Rhus javanica on left.
Machaerina with scattered
small lehua.
42.4 Melastoma.
43.2 fine trees.
dense small lehua on left,
open with gleichenia &
machaerina on it.
43.8 Thickets of small lehua
and gleichenia.
44.2 (Hilo outskirts) Kaumana
45 Cane on left grass bordering rt.
Kaumana school.
Cane fields.
45.4 Kaumana cava. Lehua - dense but small
955 973 Cane fields, grass thickets.
125 Small lehua trees.
46. Homes.